



Socially-oriented high-rise design in the Netherlands

MASTERTHESIS:
Socio-Spatial Planning

AUTHOR:
Jorrit Kootstra

SUPERVISOR:
Dr. Ir. T. van Dijk



university of
 groningen



'BARBICAN ESTATE, 1968' A SKETCH BY NORAH GLOVER OF THE LONDON ESTATE

"Willats' artwork depicts a world of isolation, confinement and quiet despair. It was created at the low point of high-rise housing in Britain: an era of badly maintained council estates seen by some as catalysts for family breakdown and crime."

(Financial Times, 2016)

INHOUDSOPGAVE

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Before you lies my master thesis for the master Socio-Spatial planning at the University of Groningen. This research is about how we can use design to enhance social interaction and cohesion in Dutch high-rises. This topic is close to myself as I live in a student house inside a small high-rise on the eight floor. Living in this high-rise, I experienced social interaction and cohesion among my neighbours to be very low. I hardly know and seldom meet my neighbours, despite living in the building for over five years. During my masters, I began to realize how the design of the building plays a role in this. I learned how people behave within the built environment, and how the built environment can stimulate certain behaviours. Much literature has in the field of planning focussed on this topic from the perspective of low-rise neighbourhoods. During my studies, we even went on a walk through my neighbourhood to see how the public space and the buildings were altered as part of an urban renewal project, aimed at improving the socio-economic issues in the neighbourhood. However, nothing was changed inside the many flats that the neighbourhood includes, only changes were made to the low-rise sections. This caused me to wonder how the lessons I learned regarding socially-oriented design could be applied inside high-rises. Especially in the Netherlands, where the construction of high-rises has increased, this topic is of particular relevance. Working on a topic that was of personal interest helped me enjoy working on my master thesis a lot. When doing something you like it will come to you more easily.

Besides writing my master thesis, I was doing an internship at KAW Architects and Advisors, an architecture and advisory firm in Groningen. Despite the topic of my thesis not directly being related to their work, they helped me throughout the process. Additionally, the design studio, one of the main methods in this research, was held at the KAW office and attended by my colleagues of KAW. As they are experts with widely various backgrounds they provided meaningful insights used in this research. I was very happy such a large amount of colleagues found time in their busy schedule to help me with my research.

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Jorrit Kootstra

SUMMARY

In this research, there is discussed how design can be used to create high-rises that enhance social interaction and cohesion. From the literature, it becomes clear that high-rises negatively influence the social behaviour of its residents. In this research, there will be examined how this can be improved in the Dutch context. A topic that is currently of special importance as the number and height of Dutch residential high-rises are increasing. The reason for this increase is twofold; (i) there is an increasing demand in urban living and (ii) restrictions on sprawling cities. These two factors are the main causes of the growth in Dutch high-rises.

In this research, we consider that design can improve social interaction and cohesion within high-rises. Many scholars have already contemplated this notion in low-rise neighbourhoods, on which this research will build. This research draws from these earlier researches on design and its influence on behaviour. Additionally, a practice analysis provides insights into design features that are used to make high-rises more socially-oriented. These practices are derived from various places and times, to create a more qualitative overview. From the practice analysis, five design lessons are identified:

- Lift public space
- Active programming
- Multifunctional and various apartments
- Connect individual high-rises
- Create a street-like environment

Next to the practice analysis, a design studio was organized. During the design studio, experts with diverse backgrounds participated to create novel insights on how to create socially-oriented high-rises. The design studio was organized in a workshop-like setting to enhance creativity. It consisted of two parts; (i) an individual part and (ii) a group part. From this design studio, various meaningful design features are identified. As expected there was overlap between the practice analysis and the design studio, yet, the design studio did provide novel insights and additions. Most of the ideas of the expert related to making communal areas

more attractive, causing residents to spend more time there. Additionally, they mentioned features that aim to make residents feel more at home and safer. By providing a human scale, eyes on the street, diversity and continuous usage, residents should feel safer and interact more.

Combing the results of the practice analysis and the design studio, the design features are aggregated into three groups; (i) low efforts/costs, (ii) medium efforts/costs and (iii) high efforts/costs. The subdivision into three groups allows for better comparisons to see which design features fit the Dutch context best. Using three SWOT analyses, it became clear the medium efforts/costs design features are best fitting to the Dutch context. The design features with low efforts/costs are very dependent on the participation and willingness of the residents, possibly demising the effects. The high effort/costs design features are useful but to some extent not very applicable to the Dutch context, as the scale of Dutch high-rise development is still relatively small. In the medium efforts/costs design group, elements are including that look like those in the high efforts group but they are of a smaller scale. These elements focus on creating specified places for interaction, enlarging communal spaces, include diverse apartments and make the high-rise multifunctional.

From this research, we can conclude that design can be used to improve social interaction and cohesion among residents of high-rises. In this research, many design features are identified that designers can pick and mix when designing high-rises. In the end, most design features aim to stimulate the following; (I) increase usage of the communal space and (ii) increase the feeling of safety. There are various ways of achieving this, varying in the effects designers must make and the effects they will have. From a more general perspective, new public-private partnerships can enhance the feasibility of including socially-oriented high-rise design. Finally, we can conclude that taking a including a planners perspective inside the design of a building is a valuable contribution, as they can provide novel insights to the design.

1. INTRODUCTION

Since the 13th century, the 'Domtoren' of Utrecht has been the highest building in the city, rising over 110 meters. However, if plans of the city government will proceed, the tower will no longer be the highest point. The city is planning to build more and higher buildings, exceeding the once-secret height of the 'Domtoren'. The new highest tower has already been approved by the municipal council. This new tower will be 140 meters high, which is significantly larger than the 'Domtoren'. By the same token, Rotterdam is currently constructing a tower of 215 meters. This will not only be the new highest tower in the Netherlands but in the whole Benelux. Next to this, the municipality of Rotterdam has recently increased the height limit of future high-rises to 250 meters (used to be 200 meters) and the areas appointed to high-rise development have been increased. The new towers in Utrecht and in Rotterdam both mainly have a residential function.

These examples fit within a wide-ranging trend in the Netherlands (Naafs, 2019). Almost all larger cities in the Netherlands are expanding their height regulations and are constructing more and taller residential high-rises. This is particularly notable given the predominantly low-rise neighbourhoods that characterise Dutch cities. As the NOS (2018) puts it "People think that they are entitled to a terraced house with a garden, that must change". This increased focus on high-rise development also produces concerns. A concern that is still often left out in the discussion are the social effects for those living the high-rises. If more people are supposed to be living in high-rises they should be attractive living environments. Currently, high-rises do not have a very positive image in the Netherlands, as high-rises in the past have often deteriorated, partially because of downward spirals in social relations. For the image of high-rises as unattractive living environments to improve, high-rises should be more socially-oriented, focussing on how people interact inside the building and not only at street level.

This research is about social inclusive design of Dutch high-rises. Before we can start elaborating on this issue, it is key to establish a common understanding of what this research refers to when talking about a high-rise and social interaction and cohesion.

Starting with the definition of high-rises. Internationally, there are many different views on the minimum height of a high-rise. This research will use the Dutch definition of a building taller than 70 meters. This is lower than the classifications used in countries with a more prominent high-rise culture, like the USA. Although this research focusses on buildings higher than 70 meters examples of buildings lower than this are also included in the analyses of this research when they provide a meaningful contribution.

With social interaction we mean how often high-rise residents meet their neighbours. For example would you recognize them and greet them when you see them walking inside the building, something Gehl (2011) calls low intensity contacts. Social cohesion takes this one step further. This is about talking with your neighbours, helping them when it is needed or having a friendly relationship, these are what Gehl (2011) calls high-intensity contacts. Out of low intensity contacts high-intensity contacts can arise, so they can built on each other. .

1.1 BACKGROUND AND RELEVANCE

There are two main reasons for the increased focus on high-rise construction. First, Dutch cities are coping with a housing shortage. Populations in the Netherlands are on the rise, especially in larger cities. Combined with decreasing household sizes, this means that more dwellings need to be constructed. However, in a densely populated country like the Netherlands dwellings cannot be constructed everywhere, simply because there is a lack of space. For this reason, cities are obligated to densify if they want to preserve their surrounding greenbelts. Second, the demand for urban living is increasing. In recent years, there has been a revitalization of an urban lifestyle. Especially young and highly educated want to live in an urban environment. Both trends, densification and increased demand for urban living, have spurred development in Dutch urban centres. Development that increasingly comes in the form of high-rises. High-rise living is planned to supply housing for a wide range of socio-economic and demographic groups. For every Dutch income group living in high-rises is becoming more normal (NOS, 2018). High-rise dwellings should provide accommodation to starters, a group that is currently experiencing extreme difficulties with finding housing. Besides starters, families need to live in high-rises

for it to be a solution to urban sprawl. High-rises need to substitute suburbs for them to create denser cities. This means high-rises need to provide living characteristics that serve a diverse group of residents.

Currently, there is much debate on building high-rises in the Netherlands. However, the debate appears to centre around the effects on the areas surrounding high-rises. In news articles most discussions are about how to deal with the infrastructure surrounding high-rises, how to make them less visible, the shade working and the creation of downwind (NOS, 2018; Bremmer, 2018). By the same token, policy documents on high rises in the city of Groningen solely focus on the effects of high-rises on the surrounding areas and the experience from the ground level (Gemeente Groningen, 2018; Gemeente Groningen, 2002). Naturally, these issues are vital to take into account, since a large high-rise building has a pivotal impact on the surrounding neighbourhood. However, another key issue that receives little attention are the effects for those living in the high-rises themselves.

Living in high-rises is substantially different compared to living in low-rises. High-rises are often associated with negative outcomes for those living in them; poor social relations being one of them. Studies and reviews concluded that high-rises are, on balance, not beneficial for residents (Gifford, 2006). Nonetheless, how the design of the high-rise could improve the social relations among high-rises residents has not thoroughly been discussed, indicating a research gap. In contrast, there is an abundance of literature available on the relationship between low-rise neighbourhood design and social cohesion and interaction, like the classical researches by Jacobs (1961) and Gehl (2011). The fact that this has not been done in high-rises is strange since high-rises are small neighbourhoods with many people calling them home. However, the task of planners usually stops at the front door of a building, which is logical in low-rise neighbourhoods but odd in high-rises as the 'public' or communal space continues inside the building. If the Netherlands is building upwards, attention needs to be given to a socially inclusive design of high-rises. A planner's perspective is a good contribution to this issue, as they are very experienced with socially-oriented design in low-rise neighbourhoods.

1.2 RESEARCH GOAL

This research creates insights on how we can design high-rises in ways that enhance social interaction, as opposed to current designs. High-rises do not only have effects on the surrounding neighbourhoods they are situated in but they also greatly influence the residents living in them. If more people in the Netherlands will be living in urban high-rises it is key to think about the consequences of this. According to research, high-rise living can have negative effects on social cohesion (Gifford, 2006). More insight into how we can better plan high-rises to increase social cohesion would have a great impact on those living in high-rises.

In the end, the results of this research provide designs and ideas that can be used in the planning of high-rises that are more socially inclusive. Taking a planners perspective creates a more holistic view on the design of high-rises. This holistic view is often applied in the planning of neighbourhoods, but not so much inside the buildings. Here, architects and developers decide on the layout and the design. Including a social planner's perspective increases the attention given to those who will eventually live in the high-rises. The goal of this research is to provide design lessons and features that stimulate social interaction and cohesion among high-rise residents, making high-rises more attractive living environments.

1.3 RESEARCH QUESTIONS

This research aims to answer the following research question:

"How can high-rises in the Netherlands be designed in a way that enhances more social interaction and cohesion, compared to current high-rises?"

This primary research question will be answered using the following three secondary questions:

1. *"How is communal space in Dutch high-rises currently designed, and which social effects does this have?"*

To say something about design solutions for socially inclusive high-rises, we must first examine the current status of high-rises in the Netherlands. Consideration must be given to historical context and trends to understand current Dutch thinking on high-rise planning.

2. *"What key lessons for socially inclusive high-rise design can be derived from international practices and experts, including lessons from low-rise neighbourhoods?"*

High-rises are not a new phenomenon and many studies and practices have been done about them already. It is vital to take lessons out of earlier studies and examples. Over the years, several 'utopian' high-rises have been created, which are worthy of analysis, as some design features did work and others not. Additionally, there are many theories on socially inclusive low-rise neighbourhoods that most likely include elements that are applicable for high-rise neighbourhoods.

3. *"What are design features and ideas that create a more socially inclusive high-rise?"*

The final question is of a more conclusive nature. Having examined Dutch high-rises planning and important lessons from high- and low-rise neighbourhoods, we can look for design features and ideas.

provides an overview of the Dutch context. A focus is on the current high-rises growth and past high-rise developmental trends. Chapter 5 shows the results of the practices analysis, elaborating on 15 practices from different times and places. Chapter 6 provides the results of the design studio, in which 14 experts worked together on the topic creating novel insights. In chapter 7 the results of the practices analysis and the design studio are combined and compared using three SWOT analyses. Chapter 8 provides the conclusions and discussion.

1.4 OUTLINE

This research contains the following chapters. Chapter 2 provides a theoretical framework that is used as a basis for this research. The main focus of this research is on design and how it influences behaviour. Additionally, chapter 2 includes the conceptual model, that provides an overview of how the main concepts relate to each other. This conceptual model is used to structure this research. Chapter 3 provides the methods used in this research. This research is a research by design drawing from a practices analysis and design studio. Chapter 4

2. THEORETICAL FRAMEWORK

Multiple theoretical concepts are used as a base for this research. These concepts range from concrete to less concrete, starting with the less concrete concepts.

This theoretical framework takes the following steps:

- First, the rather vague meaning and evolution of design is elaborated. These are theories regarding solution space and problem evolution. They are used to give a framework on how design is used to create 'solutions'.
- Second, we will discuss the influence of design on behaviour. A focus will be on how design can enable and constrain individuals. This includes the concept of affordances.
- Third, we will discuss more concrete concepts relating to socially-oriented design. Focussing on how certain design features influence social cohesion.

This theoretical framework aims to show the influence of design and how design can be used to increase social cohesion. This is of importance as the main assumption of this research is that design influences the behaviour of individuals, and can thus stimulate social interaction and cohesion in high-rises. Additionally, theories regarding which design features stimulate social behaviour are elaborated, so they can be compared to the results of the analyses.

2.1 THE MEANING OF DESIGN

First, we will look at what design contains. Design often aims to create a solution to a specific problem. However, the literature suggests a less straightforward reality. Over time, there have been multiple pieces of research explaining different views on the concept of 'solution space'. In this sub-chapter, we will discuss how design aims to create 'solutions' for ever-changing problems in a path-dependent reality.

SOLUTION SPACE AS A CONCEPT

Why does someone come up with a spatial intervention? Usually, because there is a spatial problem. This problem can be a wide variety of things; large, small, self-contained or extremely complex. The main goal of a spatial intervention is to find a solution to a problem. The set of all possible options in an optimization problem that satisfy the problem's constraints is called the solution space (Galbrun et al., 2016; Verebes, 2013). The concept of the solution space is used in many academic fields but finds its roots in mathematics, where it has a technical and numeric meaning. When the solution space is discussed in spatial sciences, the possible options to resolve a certain problem are often a lot more pragmatic (Maher & Poon, 1996). For instance, the problem of social cohesion in high-rises can be used to resolve using particular (physical) interventions. When it comes to the socio-spatial planning process, most scholars use the concept of solution space in the traditional sense: the set of possible options that could serve as a solution to a (design) problem (Galbrun et al., 2016; Verebes, 2013; Maher & Poon, 1996; Lawson, 1979; Yeh & Chow, 1996).

Academics have understood the concept of solution space in various ways at different times. Two main paradigms of the concept can be discerned; design as a search for a solution and design as making sense together (Forester, 1989):

- Design as a search process focuses on a predefined problem to which you can find a solution. This idea fits the concepts of solution space mentioned by Galbrun et al. (2016) and Verebes (2013). They state that if you put indicators or variables into an algorithm or a computational model you can find a solution space. One of the biggest problems of this approach is solutionism. This means that the emphasis is based on the solution, the magical bullet, rather than on the problem itself (Dobbins, 2009). While it is possible to find a certain solution to a problem, this solution must be flexible so it can attach itself to what is there and what might be coming (Dobbins, 2009). According to Forester (1989), too little emphasis is put on this in designing as a search process. Moreover, he disagrees with the idea of a predefined problem that has a solution (Forester, 1989).

- According to Forester (1989) design is a deeply social process about finding out what the design preferences are, hence he describes it as making sense together. This process fits well within de Roo's complexity theories (de Roo, 2003; 2007). He also explains that design as a sense focuses more on the process, is context-dependent and consists of uncertainties (de Roo, 2003; 2007).

Interestingly, both views on design relate to the divide between technical and communicative rationale of de Roo (2007). Design as search focuses on clear-cut models that can explain the reality and give solutions to problems, relating to technical rationale. De Roo (2007) argues that currently there is a new communicative rationale paradigm, where fuzzy planning is emphasised. This can be seen as planning to make 'sense'. Here, there are no clear-cut models, so planning and designing should be subject-oriented and should take the involvement of many actors and variables into account (de Roo, 2007). He states that planning has shifted its focus from ends to means (de Roo, 2003). Both views see design as different concepts.

Examining the above it can be stated that it is somewhat odd that the concept of solution space is still used in current research, by for example Galbrun et al., (2016) and Verebes (2013). In fact, de Roo (2007) already pleads for a reconceptualization of the solution space and the whole notion of thinking in models in social sciences. Forester (1989) even went as far as to argue that the concept of the solution space is something from a previous generation. This was in the late 1980's, nonetheless, the concept is still used. I believe the concept of solution space not be outdated but the terminology to be outdated. Currently research has shifted away from the idea that one can find a solution to a specific problem. Instead, what we are looking for are preferences in how to improve our environment. A preference can change over time and per person, emphasizing on complexity and relating more to the fuzzy planning of de Roo (2007). The concept of solution space could thus be reconceptualized to a preference space. Nonetheless, a preference space would still focus on what was first called the solution, causing the solutionism Dobbins (2009) talks about. A re-conceptualize into potentiality space, focusses more on the problem part of the solution space. In a potentiality-space, the focus lays on values and desires rather than a problem. Both reconceptualizations are meaningful and future research might shift more towards one of them. I still trust the concept of solution space will remain

meaningful, reconceptualized or not, as it touches upon the basis of planning and many other academic fields. If we do not believe there are models or theories which help us to predict how a spatial intervention will play out, planning would become less relevant. I believe this is not the case and models and theories can still to a large extent help us to choose the best spatial interventions. Meaning the concept of the solution space still has meaning, although it might become less focused on the solution and be reconceptualized. In this research we will still use the concept of solution space, as this is still our current paradigm and this research is not about the reconceptualization of solution space.

In the next paragraph the focus on design as making sense together. Over the years design as a search has been applied very often in the construction of 'utopian' high-rises. Here, the designer had a clear view of how his design would create the perfect building, think of the works by Le Corbusier. These planners and architects thought their designs were the solution to many urban problems. However, as we now know, these designs did not often turn out the way the designer had imagined it. The problems did not appear to be clear-cut and evolved, yet, the building could not evolve. In the next paragraph, we will go more deeply into the design as making sense and the concept of problem evolution.

DESIGN AS MAKING SENSE TOGETHER AND PROBLEM EVOLUTION

In the design as making sense together process the formation of the problem is not static (Maher & Poon, 1996). The assumption that the designers already know the problem and solution is not valid according to Maher and Poon (1996). They continue with the notion that the designers work with a 'conceptual design phase' (p. 195). In this phase, designers are not focused on finding a solution, but are still trying to figure out the problem and play around with ideas to try to understand more about the problem. This corresponds with the view of Dorst and Cross (2001), who are focusing on the 'creative leap' (p. 426) within a design process. They argue that one of the aspects of creative design is continuously defining and framing the problem just as Maher and Poon (1996). Here, the designers do not treat the design as an objective entity, but the design is seen within a wider context. In their article, they even go even further by arguing that the creative design process focuses on developing and refining the formulation of a problem. At the same time, creative design focusses on solutions that are constantly developed and refined over time. This indicates constant interaction

between the problem space and solution space. The two spaces co-evolve with each other and depend on the exchange of information between them.

Maher & Poon (1996) describe a similar model, where the process of searching the problem space and solution space is central. This is known as an exploration in design, they state that "*search has a definite goal, while exploration does not*" (p. 196). Here, it becomes clear that they distinguish their methods of exploration from the design as a search. Therefore, Maier and Poon (1996) have added feedback loops (figure 1) to their problem-design exploration model. In this model, there is a continuous interaction between the problem space and the solution space. These spaces are interacting over time. During a time-span the problem might lead to a solution or the solution is refocused on the problem. There is a continuous interaction between the two, in which it is possible that a new problem definition can change the solution space (Maier & Poon, 1996). This corresponds with the view of Dorst and Cross (2001).

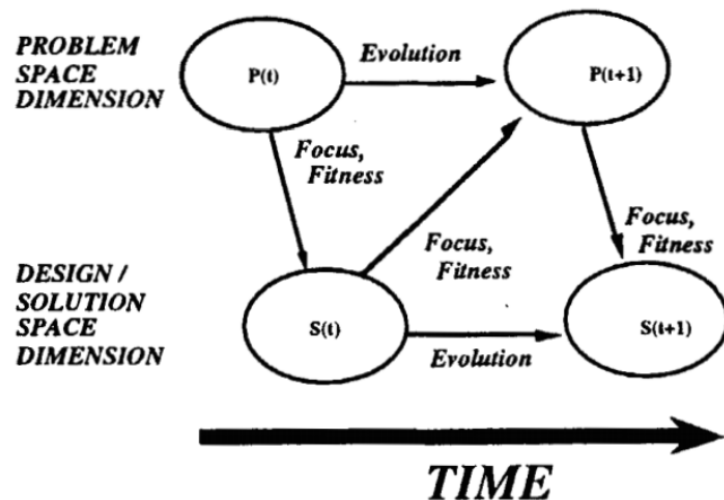


FIGURE 1: PROBLEM-DESIGN EXPLORATION MODEL (MAHER & POON, 1996)

The feedback loops that Maier and Poon (1996) propose, have a lot in common with the 'Site' concept that Lawson (1997) decides to add to his solution space definition in the years between 1979 and 1997. He nuanced his definition whereas before he deemed just the Program and the Concept categories as significant factors of the planning and designing process. Finally in 1997 Lawson decides to introduce a third category, the Site concept. Whereas the Program and Concept

category focus on the assignment at hand and the designing principles; the Site category focuses on the particular circumstances of the project. This means that whenever these circumstances change, the Site category changes, which changes the whole planning process. Lawson (1997) concludes that the idea of a finished or demarcated planning process should be let go of. This is where he would disagree with his past self. Before he described the planning process and solution space as something that was clear and could be viewed as a list of standard options (Lawson, 1979). Now, he puts it in a context-dependent view.

Coming back to the design of high-rises, design as making sense together gives interesting insights. If we would want more socially inclusive high-rises we should focus more on the design phase and take a broad perspective. Additionally, as Maier and Poon (1996) and Lawson (1997) put it, we must consider the problem and the context will change. These changes are of special importance to high-rises since they are not very adaptable. A high-rise is costly to construct and when construction is completed it is difficult to change, stretching the importance of the concept of path-dependence.

PATH DEPENDENCY AND LOCK-IN

Recognizing problem and context change the impact of design, the concept of path-dependence needs to be considered. Path-dependency can be seen as "non-ergodic", an expression that means that the current situation is dependent on history (Henning et al., 2012). One of the core researches on path-dependence is the 'economies of QWERTY research' by David (1985), in which he talks about how historical events can lock-in a path for the future that is not the optimal situation. In his research, there is a focus on the dominant typewriting system used. Almost all computer keyboards still use the QWERTY layout, although this layout has been proven many times to be inefficient. Other keyboard layouts allow people to type faster, however, as everyone knows the QWERTY layout we are stuck with a less effective system. This is because the keyboard layout is dependent on history. It would be too costly to replace all keyboards and learn everyone the new layout. This issue does not only apply to this specific case, but path-dependence has a pivotal influence on many issues. One of the main causes of path-dependence is sunk costs (David, 2000). Deviating from a developmental

path will create costs because not all old capital will and can be used in the new path, the costs of this old capital are referred to as sunk costs (Gluckler, 2007). The sunk costs in the example of the QWERTY keyboard are the keyboards themselves and the fact that everyone knows and uses this system. Particularly in high-rises, sunk costs are influential. The construction of high-rise is costly and once the high-rise is built it cannot easily be altered. This causes future use of the high-rise to be path-dependent. As Maher and Poon (1996) and Lawson (1997) mention, context is ever-changing causing high-rises to not always fit the current conditions. This also has effects on issues like social cohesion, as social habits of the residents change.

The above applies to the path-dependence of buildings. But this concept can be broadened. Especially for high-rise, rules relating to them are important. One can think of height regulations, but also building permits. These regulations influence the design of high-rises and can make certain design features path-dependant since they must be in line with the rules.

The path-dependence of a high-rise can lead to a lock-in. A lock-in means that once a course is set it is hard to deviate from (Arthur, 1989). A lock-in will cause inflexibility and causes even small historical events to be unable to influence the developmental path. Just as in the QWERTY keyboard layout. Once a high-rise is built the design cannot easily be changed, this creates high changes for a lock-in to emerge. If the design has some undesirable characteristics a high-rise can enter a negative developmental path that causes the building to deteriorate. Changing the design of a building is hard, resulting in a negative lock-in. Additionally, rules can lock-in certain building types. This process has often occurred in high-rises and is important to consider. Sometimes including flexibility into high-rises can help to reduce the path-dependence. Flexibility can relate to changing the functions of the building but also specific structures can cause the building to change and adapt more easily. Nonetheless, often the inflexibility and path-dependence of high-rises just needs to be excepted and developers should focus on minimizing the effects.

2.2 INFLUENCE OF DESIGN ON BEHAVIOUR

Having discussed the somewhat abstract foundations of design we can enter more concrete theory. In this section, there will be elaborated on how design influences the behaviour of individuals. This will be done in the following order:

- First, the enabling and constraining characteristics of design are discussed. For people using a space or an object the design of it enables you to undertake certain activities, however, it also contains you. This idea of how design impacts what you can do is essential when examining social behaviour in high-rises.
- Second, the concept of affordances is elaborated. Affordances are closely related to the enabling and constraining characteristics of design, as affordances are about what the space allows you to do.
- Finally, there will be elaborated on the relationship between design and interaction, as interaction is a focal point in this research.

In the next subchapter, more specific design features and how they influence behaviour are elaborated.

ENABLING AND CONSTRAINING

In this part, the enabling and constraining characteristics of design are discussed drawing on the research of Giddens (1992). Giddens argues there is a dualism between structure and agency. Structure relating to society and agency to individual behaviour. Although structure is created by the behaviour of individuals, structure can constrain an individual agent. This is called structuration theory; structural properties of society form constraining influences over action. Conversely, structure can also enable individuals. Giddens (1992) mentions three types of constraints:

1. Material constraint; constrain that arises out of the character of the material world and physical qualities of the body
2. (Negative) sanction; constrain deriving from punitive responses

3. Structural constraint; constrain deriving from the contextuality of action

For this research, especially the first type of constraint is important. A material constraint means that an object prohibits a user to undertake certain activities. This relates to an object in a broad sense. It can also relate to a car, that allows you to travel a larger distance but it can also relate to the communal space in high-rises that constrain you from interaction with your neighbours. Structure can also enable agents, meaning if the public space is designed properly, it can enhance social interaction. Hence, Giddens argues that when analysing situated activities of placed actors one must look at the space the activity is located in. Meaning, if we argue social cohesion is low in high-rises we must examine how the structure in high-rises enables and constrains the agents in it.

Contemplating what space allows you to do brings us to the next topic; affordances.

AFFORDANCES

In the design area, affordances are usually considered to be opportunities for action that are provided by an artefact to a human (Brown & Maier, 2015). Hence, affordances are opportunities for behaviour. Affordances are not always desirable, therefore, the design is constantly adjusted to eliminate and or hide undesired affordances (Maier & Fadel, 2003). Especially over the last ten years, researchers in this field have emphasized that objects are not merely functional but always affect the agent emotionally, making certain behaviours more likely to occur (Withagen, et al., 2012). To improve an affordance is to make the environment more compatible with the action capabilities of the human body.

The environment can, just as an artefact, invite a certain action or even urge a person to do something. The idea that the environment can prompt certain actions is also highlighted in architecture. When designing buildings, architects should be aware of how to create affordances and how they are perceived. Architects can contrive places that invite certain behaviours (Withagen, et al., 2012). Thus, concerning high-rises, the design of a building could stimulate more social interaction between inhabitants. This emphasizes the necessity of good design.

In addition to the notion that design can invite certain actions, Withagen et al. (2012) discuss how this process works. According to Hertzberger (1991), objects that present themselves explicitly and exclusively for a specific purpose, e.g. for sitting on, appear to be unsuitable for other purposes. Hence, more neutral places should be designed that stimulate the creativity of an agent. This is in line with the ideas of Jacobs (1961), who writes about emergent behaviour. In this view, what designers and architects create are not mere opportunities for action, but invitations that can have a severe influence on the behaviour an individual will exhibit in a building (Withagen, et al., 2012). Taken these views on affordances into account we can state that design can indeed enhance social interaction within high-rises. Creating neutral places can result in emergent behaviour, or creating places to meet will invite people to interact more often. This shows that design can be used in a multitude of ways. These various ways and their effects will be discussed in the consecutive chapters.

HOW DESIGN INFLUENCES INTERACTION

Design has a large influence on how people interact with each other, it can either constrain or enable interaction. According to Gehl (2011), people have contact in a build area, he calls this life between buildings. Gehl divides between high-intensity and low-intensity contacts. High-intensity contacts refer to contact you have with friends. Low-intensity contact, or passive contact, refers to seeing and hearing people. These passive contacts are more common when talking about life between buildings and the influence of design. This passive form of being with others is important. One doesn't necessarily need to have high-intensity contact with others, but the option that one could, makes people feel better. In general, people have easier contact with people living near them. To meet people on the street, cities need to be stimulating us to do stuff. Life between buildings is a self-reinforcing process. When someone does something in the street, this will always lead to more people doing something. One plus one is always two (Gehl, 2011). This matches the ideas of Jacobs (1961) who states there must be people on the street for people to feel safe. A well-used street is always safer than a deserted street.

Relating the above to high-rises, the street can be understood as the public space within a high-rise. Because a high-rise is characterized by a high population density, this could have positive effects on the interaction between people (Gehl, 2011; Jacobs, 1961). However, for this to happen people need to be in the public space inside or around the building. Unfortunately, this is often not the case, causing high-rises to have low levels of interaction. Whereas a high-rise has potential, there are design characteristics at play that often negatively influence the interaction between people. Many scholars have identified an array of characteristics that are important for good design. In the next subchapter, we will highlight some of these and other design features that are alleged to influence social interaction.

2.3 SOCIAL INCLUSIVE DESIGN

Having established that design has a pivotal influence on behaviour, we can discuss some main hypothesis on how this process works. Derived from the literature, some key design features that influence social behaviour are identified:

- Public and private
- Diversity
- Community building
- A vertical urban environment

These design features are derived from the literature as they supposedly have a large effect on social interaction and cohesion. The design features are elaborated in the subchapters below. This will create an overview and a theoretical basis on which we built the answer to the research question. Additionally, it helps to interpret and understand the design features derived from practice and experts.

PUBLIC AND PRIVATE

One of the key design attributes is the division between private and public. This is meaningful in two ways; the division between public and private space and the role of public and private organizations.

First, the division between public and private space is elaborated. Much research and examples can be found that have tried to create the perfect division between private and public space, ranging from clear demarcations to a diffuse private-public space. Especially for high-rises, this private-public space demarcation is important to consider. High-rises are often characterized by odd public-private relationships because the spaces within the high-rises are often both public and private.

Gehl (2011) discusses the importance of a good public-private ratio. Public and semi-public places can create a sense of community. He argues it is beneficial to subdivide a neighbourhood into different sub-neighbourhoods that all have their own semi-private space. Together these sub-neighbourhoods share a larger public space. For example, a public town square and semi-private neighbourhood squares. This clear structure would, according to Gehl, help people to understand who belongs where. It also creates a sense of belonging. The semi-private places allow people to have a larger sense of belonging and makes them feel safer. For example, this can result in children being allowed to play outside at an earlier age. This should, as we have seen in the previous chapter, create more activity and thus more interaction. Interestingly, Gehl (2011) mentions that this concept is harder to create in high-rises since it is not clear where one neighbourhood ends and the other begins. Creating a more diffuse sense of community. And, as Jacobs (1961) also mentions, a clear demarcation between public and private space is important. However, I believe this unclear division between public and private space does not need to be the case in high-rises. If we consider a high-rise to be a neighbourhood, there is a very clear border where the neighbourhood ends and where the other begins. Additionally, subdividing a high-rise into multiple blocks with their own communal spaces create perfect semi-private places were Gehl talks about. The inflow of visitors in these spaces can be controlled very easily, as one needs to have a key to enter the building. This makes the semi-private communal spaces safe and thus better places for interaction. Next to these safe semi-private spaces the building can also host public areas, for example on the rooftop, where people can interact with strangers. This provides the clear structure Jacobs and Gehl emphasize on.

An important trend to consider, especially for high-rises, is the privatization of public space. This trend is a function of corporations producing larger and more clearly defined spaces, shopping malls, private places of entertainment, residential

locations and office parks, that can only be entered and used only by invitation (Kirby, 2008). The construction of more high-rises is part of this trend. Usually, the space inside high-rises and the space around it are only accessible to inhabitants or visitors. Hence, 'public' spaces and facilities that are created within high-rises are private. The effect of this is that what were once apparently open spaces, for instance, parks, or streets adjoining individual stores and businesses, may turn into controlled spaces. This is a negative effect since the loss of undifferentiated public spaces leads to a diminution of the ability of individuals to meet and interact freely with others (Kirby, 2008). This relates to the fact that individuals are denied entry to places. Although it is not necessarily the case that these excluded places have less social interaction, it does say something about the qualities of these interactions. Atkinson and Blandy (2005) even argue the loss of public spaces causes a "downward spiral of urban social relations". The emerging private spaces are seen as further fragmentation of the city. Causing changes in the right to be in the city as a totality.

If we consider high-rise construction to create privatized public spaces, the next step is to examine what these spaces would look like and what aspects matter. If designed properly, these privatized public space could enhance social interaction, although the quality of these interactions might still be lower. In an article by the Financial Times (2016), architect Julian Chen argues how these private-public spaces are frequently designed. Cheng mentions that in traditional high-rise buildings are designed to have as small a core as possible (the services part, like the lifts and the plumbing) and you try to squeeze in as many units as possible. This means that, when you leave your flat in the morning, you walk through an artificial corridor to the elevator and disperse as soon as you can. This creates little space for social interaction. However, there are solutions to this. If more space within the building is reserved for public space, more generous communal areas can be created. Yet, this is more costly, since this space cannot be sold or rented to users. Additionally, there is another problem, concerning maintenance. There are inbuilt inefficiencies that come with scale and height. If a high-rise includes more communal areas for people to meet, these must also be maintained. This relates to Kirby's (2008) discussions on privatized public space. Public spaces are in the Netherlands maintained by the government. However, the privatized public spaces in high-rises are not, although considerable costs are connected to the

upkeep of these spaces. Antony Wood (2014), the executive director of the CTBUH, mentions this structure must change. He mentions:

"[We need] public-private partnerships. Who pays for the roads, the parks, the sewerage and the lighting in every city? The local government. Yet, their responsibility stops at the door of a tall building, then, it's just the developer's responsibility. Each building needs to become a public-private partnership; financially, operationally and programmatically."

For this to happen, we must fundamentally change our conception of cities. It would ask a different task from government and private developers.

This brings us to the next issue relating to public and private, the role of organizations. Private organizations that develop high-rises what to make as much revenue as possible. Hence, they minimize spaces they cannot derive rent from or make the apartments more expensive. This situation is not encouraged by public organizations that aim to provide good living environments for everyone. The idea of Wood (2014), to include more public-private partnerships in high-rise development could be a solution, but it is a difficult one. If a city government would fund communal spaces in high-rises they must be publicly accessible. The government gets money from taxes, which are paid by everyone. Spending taxes only on those living in high-rises creates problems concerning justice theory. Making communal spaces inside high-rises publicly accessible is an option, but a hard one to implement, as this can cause nuisance to residents. Easier would be if governments make rules concerning high-rises. A government can make rules that force high-rises with a certain amount of dwellings to include a set number of communal areas. However, this can reduce the willingness of developers to construct high-rises as they are more expensive. Still, governments need the high-rises to increase the housing supply without expending the city.

Whereas, Wood (2014) only talks about public-private partnerships I believe private-private partnerships could also be a solution. A high-rise can include commercial facilities like a gym or coffee bar. This creates revenue for the developer of the high-rise and it creates more places to interact for the residents. The largest issue with this is that these commercial facilities require payment for the residents to use them. Nonetheless, a high-rise that includes a coffee bar

offers more opportunities for interaction with neighbours than those without. The same goes for a gym, many people go to a gym on a regular basis anyway and one inside the building increase interaction among residents. This topic concerning the role of private and public parties is still up to discussion and will most likely evolve in the future as more and higher high-rises are constructed.

DIVERSITY

The second design feature is diversity. One of the main arguments of what makes a good city, according to Jacobs (1961), is diversity. Jacobs mentions four types of diversity that are essential to a liveable city.

- Diversity in functions
- Diversity in street block size
- Diversity in buildings
- Diversity in people

The first type of diversity Jacobs mentions is a variety of functions. Different functions are used at different times during a day. E.g. a workspace is used during the day and a restaurant is only used at night. This is called a mono-functional city. The monofunctional city is an unfortunate development where different uses are confined to different areas and where the lack of mixed uses have huge impacts on public life in the area during day and night (Gehl, 2014). According to Gehl and Jacobs monofunctional cities can make people feel unsafe. Areas with primary uses as e.g. residential building tend to be areas which are only lively during the morning and evening. Outside these peaks, the areas appear to be isolated and deserted and do not act as pleasant destinations for visitors. The above can be applied to high-rises. If a high-rise only contains residential buildings they are in fact a monofunctional neighbourhood. This causes the perceived safety to decrease, as the buildings are mostly empty during the day. Hence, diversity in functions impacts social interaction in high-rises.

Jacobs' (1961) second diversity type is the size of the street blocks. Although this is a very American concept and less applicable to high-rises it is still important to examine this point. Jacobs mentions if the blocks are too large they are seen as a barrier. People meet at the corners of blocks and interact with each other at these

places. Smaller blocks create more of these meeting places and additional routes one can make through a city. In some way, Jacobs' notions on block size also apply to high-rises. Within a high-rise, there are usually long straight corridors. There are no different route options and little places to interact. Hence, one quickly moves through the hallway to enter the elevator and go outside. This causes no time and places to be left for social interaction with neighbours.

The third diversity type Jacobs (1961) talks about is building diversity. Here, Jacobs talks about diversity in building age and size. Talking about high-rises diversity in building age is somewhat difficult to apply as the whole high-rise is most often constructed in the same time. Additionally, if there is a cluster of high-rises in the Netherlands, they are also most often part of the same masterplan. Therefore, we will focus more on the diversity of sizes. According to Jacobs, building diversity leads to a diversity of people living in them. This means a high-rise should include multiple types and sizes of apartments for them to facilitate a wide array of residents. Additionally, different apartment sizes in one building would allow people to move within the building, creating a larger sense of belonging. Because when you live longer in the same place you will invest more in the living environment.

The fourth type of diversity is population diversity. This is related to population density. According to Jacobs, high density is important for people to meet. She mentions diversity does not necessarily lead to the formations of slums, but that it leads to diversity in interactions. This diversity should be reflected in residents as well as visitors. Especially the addition of visitors is important. Often the privatized public space of high-rises is only accessible for a selected few (Atkinson & Blandy, 2005), consequently, you have less chance to meet visitors and interact with them.

COMMUNITY BUILDING

The third feature is community building. For people to interact with each other it is important they feel they are part of some kind of community. Although this may not seem to connect to design directly, community building is implicitly influenced by design. As we have seen, design can, through affordances, invite certain types of behaviour (Withagen et al., 2012). Hence, certain design elements or facilities

within high-rises could invite community building within the high-rise. This will create a larger sense of community and thus more interaction.

Building a community can be stimulated by design. This statement is becoming more and more accepted. An increasing amount of high-rises include facilities for its inhabitants. Example facilities include communal areas, sky gardens, fitness, and cafes. All over the world, this concept has been introduced, from New York to Groningen. An exceptional example of this is the Urby building in Jersey City. This building aims to provide quality housing at low prices. In its design social issues are central. Inside the high-rise, they want to create a feeling of home (Volkskrant, 2016). The architect, Erikjan Vermeulen, explains in an interview how he tries to create this feeling of home. First of all, he mentions that community life is actively programmed to encourage interaction and connection among (New York Spaces, 2017). The building has a director of programming that organizes events and programs held in the community spaces. He does this with local artisans and small businesses, which helps to encourage connections between residents and the surrounding community. Additionally, there is a whole floor reserved for resident-only communal areas. Including a gym, yoga studio, communal kitchen, swimming pool, and urban garden, all designed to create a feeling of home. On their website they state the following about the shared spaces inside the building:

"'Always-on' social spaces bring life and energy to where you live. Break a sweat in the fully-equipped fitness space or yoga studio. Hit the Urby Kitchen for events over food. Or head to 9 Bar café, our humming local hotspot with the best coffee, bites, and atmosphere around." (Urby, 2018)

The above sounds like a utopian high-rise dream, especially concerning the topic of community building. However, research tells us it is not always that easy. The main issue with high-rise facilities is the maintenance charges (Wahab et al., 2016). This often leads to poor facility maintenance in many high-rises. Additionally, Wahab et al. (2016) call attention to the distribution of maintenance costs. As not every resident uses the facilities at the same frequently arguments can occur about the distribution of the maintenance costs, something which does not contribute to the sense of community. Wahab et al. (2016) classify facilities in high-rise residential buildings This can be a guide for the management to determine the realistic maintenance cost to be imposed on the residents of high-

rise buildings. This classification creates an improved management system for high-rise residential buildings. In their research, they identify three different types of facilities.

- Basic facilities; including a combination of commercial, open recreation, parking, and building service facilities.
- Exclusive facilities; including a combination of security, closed recreation and open recreation facilities.
- Support facilities; include a combination of community and education facilities.

Depending on the type of high-rise the presence or payment structures for these facilities can differ. High-rises should include the basic facilities, which can be extended by exclusive facilities but only in buildings where demand is for them. The supporting facilities are provided only to those who pay an additional fee.

Including a communal area into a high-rise design is a good first step. However, the availability of facilities is not sufficient. There should be some kind of program for the usage of the facilities, something to draw residents to these areas and contribute to community building and increase social interaction.

A VERTICAL URBAN ENVIRONMENT

The fourth design feature is building a vertical urban environment. If we are indeed constructing more and taller high-rises in the Netherlands, it might be time to reconsider how we plan a high-rise city. As mentioned in the introduction, building high-rises is a response to a growing demand for urban living. If there is a high demand for urban living we can do two things; go horizontal or go vertical. Going horizontal is not a solution, as regulations often prohibit Dutch cities to expand. Additionally, history has taught us that urban sprawl also comes with its issues. Antony Wood (2014) mentions, if we can't go horizontal we must go vertical. Figure 2 displays a city with all its infrastructure, buildings and public spaces. If this city wants to grow it must go up. But how do we do this in a sustainable way?

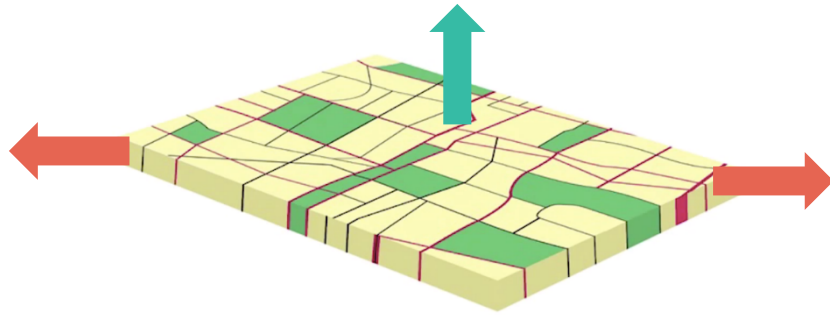


FIGURE 2: THE EXPANDING CITY (WOOD, 2014)

Having established the following, we can examine how we would develop this vertical city. What we currently see all over the world, including the Netherlands, is that private developers are constructing individual buildings. These buildings often have their own typology and target group, e.g. Groningen is currently planning many individual student housing high-rises. This creates a city as we see in figure 3, containing individual high-rises that are disconnected from each other and the urban fabric.

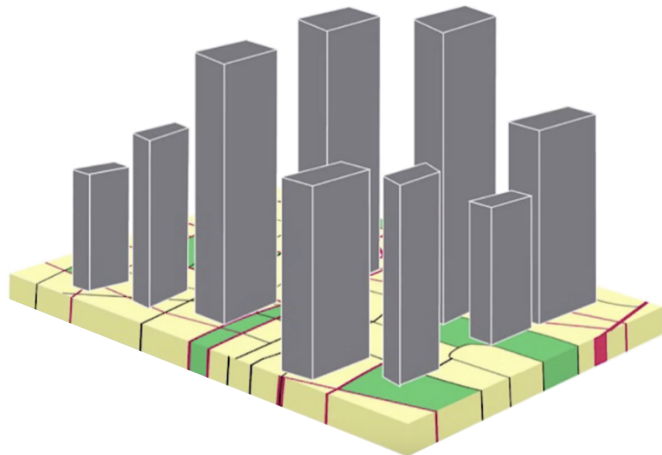


FIGURE 3: CITY WITH INDIVIDUAL HIGH-RISES (WOOD, 2014)

According to Antony Wood (2014), this is bad. He argues we must take the horizontal city of figure 1, with all its infrastructure and facilities, and flip it vertically. This means we need to no longer see high-rises as individual buildings but as neighbourhoods of the city. They need to provide inhabitants, just as low-rise neighbourhoods, with shops, parks and other facilities. Figure 4 shows what this should look like.

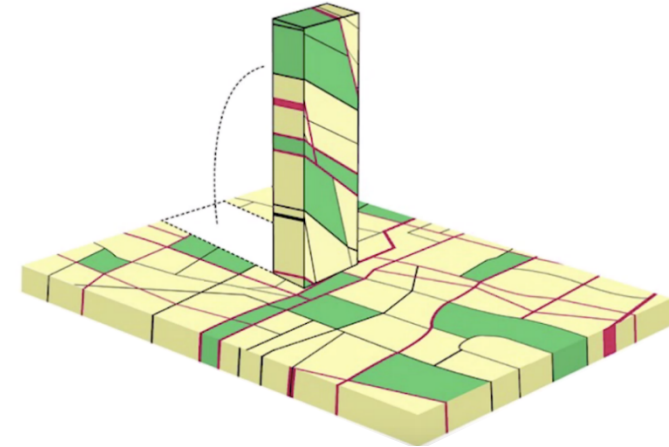


FIGURE 4: HIGH-RISE THAT INCLUDES URBAN FABRIC (WOOD, 2014)

Besides the inclusion of the urban fabric into a high-rise, Antony Wood (2014) mentions we must include this concept in all high-rises and connect them. We need to consider high-rises as part of the city, not just as buildings. For this to happen we need the public-private partnerships that were earlier discussed. This would, as he calls it, create vertical urbanism (Figure 5).

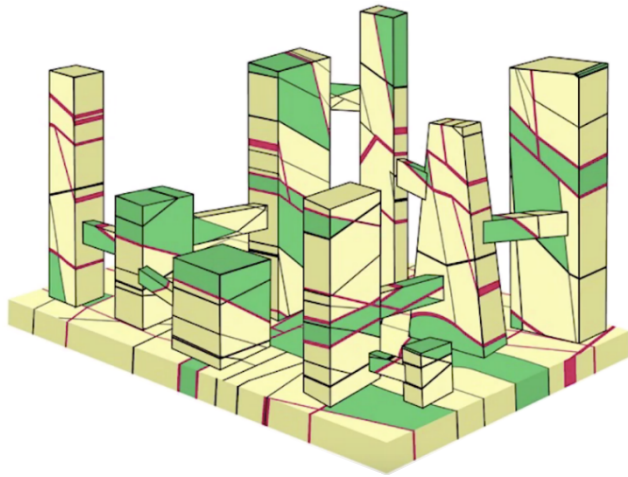


FIGURE 5: VERTICAL URBANISM (WOOD, 2014)

The vertical urbanism that Antony Wood (2014) discusses creates a dense infrastructure rich city. Interesting is that a key factor of this vertical urbanism is bringing the horizontal urban habitat up, so you expand the horizontal space by going vertical. This model for urban planning can already be found in some Asian cities. The clearest example of this is Hong Kong. Along the Central Elevated Walkway in Hong Kong you can walk for miles without touching the ground. This creates an elevated city and connects individual high-rises with each other. Hong Kong is a city with one of the highest concentrations of high-rises in the world, this makes it hardly comparable to the scale of Dutch high-rise development. However, we can draw lessons from these developments and apply them to a smaller scale. Additionally, Dutch cities usually see a concentration of high-rises at specific places, e.g. 'de Zuidas' in Amsterdam and 'Kop van Zuid' in Rotterdam.

2.4 CONCEPTUAL MODEL

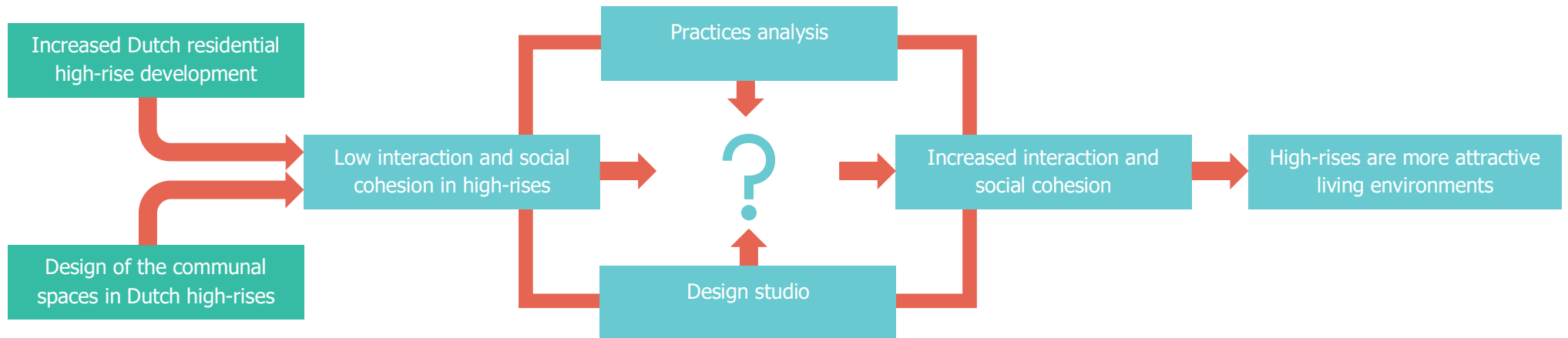


FIGURE 6: CONCEPTUAL MODEL

Figure 6 shows the conceptual model used in this research. The conceptual model will be used as a guide in the structure of this research. Each chapter will provide a small image that visualizes how the chapters fit into the conceptual model, indicating its relevance.

The conceptual model displays the following relationships. We will start by explaining the three left boxes and how they relate to each other. From various researches, it becomes clear that interaction and social cohesion is low among those living in high-rises. This causes high-rises to not be very attractive living environments. This research aims to investigate how social behaviour in high-rises can be improved, making them more attractive to live in. This is meaningful to investigate because residential high-rise construction in the Netherlands is on the rise. Both the number and the height of residential high-rises are increasing. To investigate how residential high-rises can be improved a focus will be on the design of the communal spaces within the high-rises. As has been established in the preceding chapter, the design of the communal areas has a large influence on behaviour. Hence, it is used as a focal point in this research.

Having established that social interaction and cohesion in high-rises is low, this research uses two methods to investigate how to improve this. The methods are visualised in the middle part of the conceptual model; a practices analysis and a design studio. Both methods have the same goal; to identify design features that increase social behaviour within residential high-rises. The practices analysis looks at design elements that stimulate the social behaviour of existing or proposed buildings. The design studio derives design elements from experts that worked together on the topic. Both methods are executed separately, meaning they did not influence each other. This allows them to be compared and combined, to see how they differ. When both the results of the practices analysis and the design studio are combined the most useful design elements can be identified. As both methods are executed independently the quality of the design elements is improved, as they can be tested upon each other.

In the end, a number of design features are identified that increase social interaction and cohesion in residential high-rises. When developers implement these design features in Dutch high-rises, they will become more attractive living environments. This relationship is visualized in the two right boxes

3. METHODOLOGY

In this part, we will explain the methods that are used as a basis in this research. This research takes a mixed-methods approach, by doing a practice analysis and a design studio.

This research is a research by design. Hence we will structure this chapter in accordance to the design phases that are identified by Roggema (2016):

- The pre-design phase
- The design phase
- The post-design phase

First there will be discussed what research by design entails. Then there will be elaborated on how each step in this research is reflected to the design phases of Roggema (2016). Finally, the two main data collection methods of this research are further elaborated. These are the practices analysis and the design studio.

3.1 RESEARCH BY DESIGN

This research takes a somewhat different approach than most researches on urban planning. Instead of taking a more descriptive approach this research concentrates on something that is called research by design. In this chapter, we will predominantly draw on research by Roggema (2016). In his research, he sets out a practical methodology on how design can be used as a method in spatial research. This is necessary because research by design lacks clear definitions and sound methodologies. Design and research are two phenomena which some declare to be wide apart. Scientific research is analytical, searching for objective and universal truth. On the other end, design is described as explorative and innovative, exceeding the limits of the body of knowledge both in a methodological and a theoretical way, it is exploring several truths, and studies multiple futures. According to Roggema (2016) design research is both the study of design and the

process of knowledge production that occurs through the act of design. He defines it as:

"Research by design is a method, which uses design to research spatial solutions for a certain area, accommodating a design process, consisting of a pre-design phase, a design phase and a post-design phase, herewith providing a philosophical and normative basis for the design process, allowing to investigate the qualities and problems of a location and test its (spatial) potentials, meanwhile creating the freedom to move with the proposals in uncharted territory, and producing new insights and knowledge interesting and useful for a wide audience." (Roggema, 2016)

In this research, this relates to investigating the effects of different high-rise designs on social cohesion and, consequently, generate knowledge on how to design a socially inclusive high-rise. The methods used in this research coherent both to 'research by design' and 'research through design'. Research by design is used to describe the various ways in which design and research are interconnected when new knowledge is produced about the world through the act of designing (Barbosa et al., 2014; Hauberg, 2011). Research through design is slightly different and is defined as a designerly inquiry focused on the making of an artefact with the intended goal of societal change, using design to look at what a potential future might be (Roggema, 2016).

There are two main arguments why research by design is a suitable approach to plan for the future. Firstly, research by design helps when planning the future can no longer be based on the certainty of programmes and conditions. Instead, the planner is confronted with changing conditions and shifting programs. This relates to the problem-design exploration model of Maher and Poon (1996), where problems and solutions are constantly shifting and influencing each other. According to Roggema (2016), this forces the planning process to be transformed into a process of multiple feedback. It needs to become reflexive.

Secondly, many problems in the current time-frame can be considered complex. Climate change, migration, and other economics and social issues are bound to reveal further complexity. These issues lack a final solution and need to be

continuously treated and directed to create a better future. These are the so-called wicked problems. There is no single, accepted formulation of these problems. Also, the answers are often defined in “more-or-less” terms in which planners and managers at best can find reasonable, but shifting balances among competing interests and values. The correct formulation of the problem cannot be known until a solution is accepted. These persistent problems cannot be approached with regular thinking. They require counter-intuitive thinking and the development of new knowledge. Design is a very suitable approach for these types of problems because it makes creative jumps in thinking and solving possible. Plans based on this approach reflect the uncertainty of urban development.

Combining the above and relating it to this research topic. The question of how to design socially-oriented high-rises is one of an uncertain and complex nature. High-rises are rigid, meaning once it is built it cannot easily be changed. However, the world around the high-rise is constantly changing, and so do the issues relating to people living in high-rises. As the problems concerning high-rises are shifting, research by design helps to create innovative solutions that relate more to the current state of the issues. Secondly, the issue of social interaction in high-rises is complex or wicked. There is no real answer on how to solve this issue and plans must take the uncertainty into account. Nonetheless, research can aim to improve the situation.

3.2 DESIGN PHASES

The three design phases of Roggema form an important basis for the structure in this research. As this is a research by design it will follow the same three steps as Roggema describes in his research; the pre-design, design, and post-design phase (figure 7). In this section, we will elaborate on each phase and examine how it fits in this research. Identifying how each design phase fits in this research shows the relevance of the different sections and provides a structure for the reader. In the next section, the data collection methods will be discussed to a larger extent.

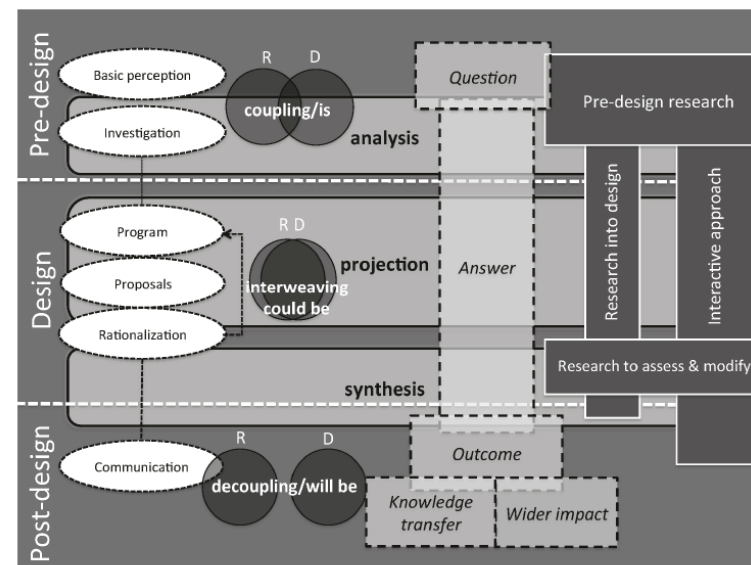


FIGURE 7: COMBINED APPROACHES OF RESEARCH BY DESIGN (ROGGEMA, 2016)

THE PRE-DESIGN PHASE

The first phase, pre-design, is characterized by understanding. Before a design can be made it is vital to carry out research. This pre-design research aims to bring a basic perception about the question at play and starts the analysis and investigation of task, context and potential avenues for research and design. Here, research and design are coupled. This coupling provides insights into potential answers and future design directions (Roggema, 2016). This process looks like the exploration of the solution space discussed at the beginning of the theoretical framework space (Galbrun et al., 2016; Verebes, 2013). In this phase, research and design are carefully studied to create a solution space. Vital to the pre-design phase is to verify if the problem or issue is indeed a wicked problem. Meaning it cannot be addressed through simple engineering or scientific methods.

The first step of the pre-design phase, understanding the question, has already been discussed in the introduction and theoretical framework. The second step is to collect information regarding the qualities and (historic) characteristics of the issue, in this case, high-rises, and about the programmes, policies and

expectations. This will be done via the exploration of current Dutch high-rise planning and existing international high-rises, drawing from practices.

THE DESIGN PHASE

The core of design research is the second, design, phase. In this phase the interactive approach is intensified. Exchanges with end-users, stakeholders and experts are carried out. Research and design are closely interwoven. Design is a reflective practice in which critical assessment, comparability and evaluation take place through sketching, continuous weaving between problem and solution in an iterative movement between analysis and proposal (Roggema, 2016). The designer is a researcher in practice context.

This research solely focusses on exchanges with experts, as including stakeholders and end-users will make the scope of this research to big. For the interactive exchange with experts, a design studio is carried out. In the design studio, a group of experts are, in a workshop-like setting, asked to think about the issue and share their insights. The design studio aims to create novel insights and knowledge on the topics, generated by an interactive and creative process.

POST-DESIGN PHASE

In the post-design phase, the results are central. The results show how the future is seen, and what the future will be. Two vital components need to be addressed in this phase. First, the impact for the wider community from both an academic and social perspective. Second, the new knowledge, developed during the design phase, needs to become available for a wider audience (Roggema, 2016). In this phase, research and design are decoupled. On the one hand, the design results are presented in reports, panels, drawings and schemes, while on the other hand, the research outputs follow the route of academic publishing and debate.

In this research, we mostly focus on the research output, as the end product is a master thesis. In the conclusion and discussion chapter, the effects of the design features identified in this research are addressed. Additionally, during the design studio and the graduate research day the first findings were presented. And the

participants of the design studio, all architects and advisors actively working in the built environment, will receive the results of this research. This will ensure the results of the research are shared.

3.3 THIS RESEARCH

Having discussed how the structure of this research fits within the different design phases, we will now elaborate on the methods used. This research mainly focusses on two methods; an analysis of practices and a design studio.

These two methods are not used for no reason. When doing a research, a researcher can use a wide array of methods to answer the research question. Social sciences often use surveys or interviews. This research takes a different approach by focussing on a practices analysis and a design studio. These methods are best fitting the research by design characteristics of this research (Roggema, 2016). However, there are alternative methods. Using a survey would have been an appropriate method for this research if the experiences and opinions of residents of high-rises were included. A survey can provide large amounts of comparable data on, for example, which design features residents like most. However, as this research focusses on in-depth information provided by experts, as survey is not appropriate. Opposed to a survey, an interview can be useful for this research but the design studio is more suitable, as it allows for more creativity and better correspond to a research by design. Additionally, because a wide array of experts attended the design studio, their various academic backgrounds are combined into design features directly. This would not be possible when using individual interviews. The practices analysis does not have any comparable methods that could have offered a useful alternative.

Below both methods are elaborated. As mentioned, both methods are executed separately and did not influence each other. Afterwards, both methods are compared and combined. This is important to keep in mind.

PRACTICE ANALYSIS

The first method is an analysis of practice. The practices analysis gives insight into which lessons can be derived from previous attempts to create socially-oriented high-rises or buildings. From these practices important design lessons can be identified which will be compared to the results of the design studio, to create a more thought-out design that combines practice and expertise.

Many issues vary in time and space. This also goes for social issues in high-rises. Throughout the years, many architects and designers have tried to create utopian high-rises that would create the perfect living environment, think for example about Le Corbusier. However, over time, the ideas about this perfect living environment changed. This caused high-rises that were once designed to create more interaction and cohesion among inhabitants to have a very different outcome. Each high-rise reflects the issues and leading knowledge of that time. It is therefore key to consider high-rise designs from various time-periods as this allows us to examine how these design features evolved throughout their use. In like manner, it is important to examine high-rises with various geographical locations. Cultures differ across the world, some are more individual and value privacy, while others are more collectivistic. This has a large influence on how people act within a building and how buildings are designed. For example, in Arabic culture much more value is given to privacy compared to Asian countries, which is reflected in the design of high-rises. Additionally, geographical location influences design features, think for example about as density, demand for space and climate.

This research examines 15 practices from across the world and time-periods (Table 1). Not all of these 15 practices are a high-rise or considered a high-rise by the 70-meter definition this research uses. Nonetheless, all practices show district design features that are of special interest in this research topic. These buildings are identified as suitable practices out of diverse motivations:

- First, various architects and experts with a background in socially-oriented design were asked to identify buildings that included interesting design features that lead to more social interaction. Most practices are derived from this method.

- Second, the Council on Tall Buildings and Urban Habitat (CTBUH) hands out yearly awards to best high-rises. Additionally, the CTBUH organizes conferences in which high-rises and proposed designs are discussed. From both the awards and the high-rises discussed in the conferences, most suitable practices are picked.
- Third, via a search on the architecture websites on the internet, a view high-rises that have socially-oriented design features were identified.

The practices analysis includes 15 buildings, while many more take interesting approaches in socially-oriented design. Yet, choices needed to be made as they could not all be included. A variety in age and place was often the main reason to exclude buildings. Singapore for example hosts many socially-oriented high-rises, however, only including buildings from Singapore creates a skewed image. Hence, only the most novel and 'best' (according to the CTBUH) buildings in Singapore are used. Below you can find an overview of the various high-rises (table 1).

TABLE 1: CASES PRACTICES ANALYSIS

High-rise name	Location	Time
Barbican Estate	London	1970
Case Study Cape Town	Cape Town	Conceptual
Case Study Sustainable Vertical Urbanism	Unknown	Conceptual
Central Elevated Walkway	Hong Kong	1970 and onwards
De Citadel	Almere	2006
De Helix	Groningen	2019
Family scraper De Maasbode	Rotterdam	Under construction
Ivry-Sur-Seine	Paris	1980
Linked Hybrid	Beijing	2009
The Commerzbank Tower	Frankfurt	1977
The Interlace	Singapore	2013
The Pinnacle@Duxton	Singapore	2009
The Stack	Melbourne	Proposed
Unité d'Habitation	Marseille	1952
Urby	Jersey City	2016

All high-rises are analysed in the same way. First, the context of the high-rise is discussed. As mentioned, the location and building period of the high-rise can often explain a lot about why certain design decisions are made. Hereafter, two questions are answered regarding the high-rise; what was it meant to be? and what is it? The first question is about why the designer or architect included certain elements in its design and what the designer wanted to achieve with this. The second question is about how these design features played out. Often there are differences in how the design was meant and how it evolved through usage. Finally, on overview with the design features, their goal and their result are given.

DESIGN STUDIO

The second method in this research is a design studio. In the design studio, experts from various backgrounds work alone and together on socially oriented high-rises. A design studio is a method that is often used in architecture as it brings together a group of diverse experts that work together in an interactive and creative process creating new insights (Ungar & White, 2008).

The design studio was held at KAW architects and advisors. This is a firm that works on spatial solutions that contribute to good living quality. They are especially focussed on the people that live in a space and create the best environments for them. At the company, there are people with a wide variety of backgrounds. Hence, the company is a suitable place to host the design studio. Additionally, from a more practical point of view, I did an internship at the company so I was able to get more participants and use the facilities of the office.

The design studio was composed of three phases derived from research by Nielsen Norman Group (2017):

- Introduction into the topic
- Individual brainstorm
- Designing in groups

During the introduction to the topic, I give a small presentation mostly focussing on the relevance of the topic and the programme of the studio. I intentionally did

not give any examples of how socially oriented high-rises could be designed, as this would influence the ideas of the participants.

After the short introduction, the participants were asked to brainstorm about the topic on their own. Research shows that during brainstorming the best results are created when individuals brainstorm on their own and then pool their ideas (Lindstrom, 2011). When brainstorming in a group efficiency is lost because when one person talks the rest is not productive and people have less risky behaviour when working in a group. These two factors can negatively affect the creation of innovative ideas. The individual part consisted of two rounds. In the first round, the participants had around 5 minutes to come up with multiple ideas. Each participant was given a sheet of paper that was subdivided into six boxes. The time and space caused the participant not to think their ideas through, but write down all the ideas that came up in their mind. This would create more creative ideas. In the second phase, participants had 5 minutes to generate one, more carefully thought of idea. In this phase, they were encouraged to build on a previous idea or combine elements of several ideas from the previous round.

The individual part was followed by a part where the participants worked in groups. This phase had as end goal to create a design for a social inclusive high-rise. When performing a creative task, groups outperform individuals, if all individuals are of similar skill level (Lindstrom, 2011). As they were all experts this is the case. The participants first had time to each shortly present their ideas to the group, hereafter, they worked together on combining and creating ideas on a large piece of paper. In the end, each group shortly presented their ideas to the whole group.

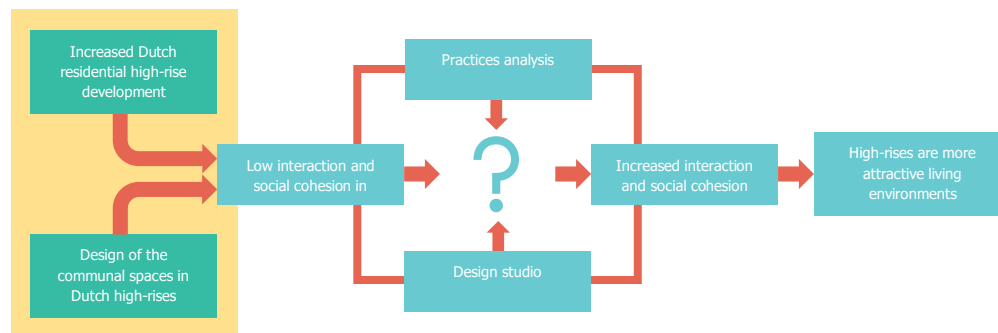
At the design studio, a total of 14 people participated and a small interview was held with an architect who was not able to attend the design studio. The date and time of the workshop were carefully planned to ensure the maximum number of respondents. The design studio was held in the office of KAW on a Thursday afternoon when there are usually many people in the office. Additionally, the design studio only took around 1 hour and 15 minutes, which is short, but as it was during office hours the time of the participants had to be respected.

3. DUTCH HIGH-RISES

In the introduction of this research, the context of high-rises in the Netherlands was already shortly touched upon. In this chapter, the first research question of this research is answered:

"How is communal space in Dutch high-rises currently designed, and which social effects does this have?"

Looking at the conceptual model this chapter investigates the two left boxes; (i) increased Dutch residential high-rise development and (ii) Design of the communal spaces in Dutch high-rises. First, the current Dutch high-rise growth and the reasons behind this are elaborated. Second, an analysis of previous trends in Dutch high-rise development are highlighted. In this section, attention is given to the design of the high-rises constructed during the various trends.



3.1 DUTCH HIGH-RISE GROWTH

The Netherlands is a densely populated country, yet, it is characterized by predominantly low-rise neighbourhoods. Because of a population increase and a growing demand for urban living Dutch cities are going upwards (NOS, 2018). This especially goes for the larger cities in the Netherlands, located mostly in the central 'Randstad' area, as can be observed in figure 8. Mainly the metropolitan area of Rotterdam and The Hague has a large number of residential high-rises. In the structural vision of the Randstad, high-rises are seen as one of the key instruments to facilitate the growing demand for dwellings (Buck Consultants International, 2009). High-rises are a means to create denser cities. As household sizes in the Netherlands are decreasing, high-rise construction can ensure the Dutch do not need to sacrifice all the unbuilt areas in the Netherlands. Hence, the number of high-rises in the Netherlands is growing. As figure 9 and 10 show, the number of high-rises and their height has grown. After a decline during the crisis, there are many proposed residential high-rises, with significantly larger height.

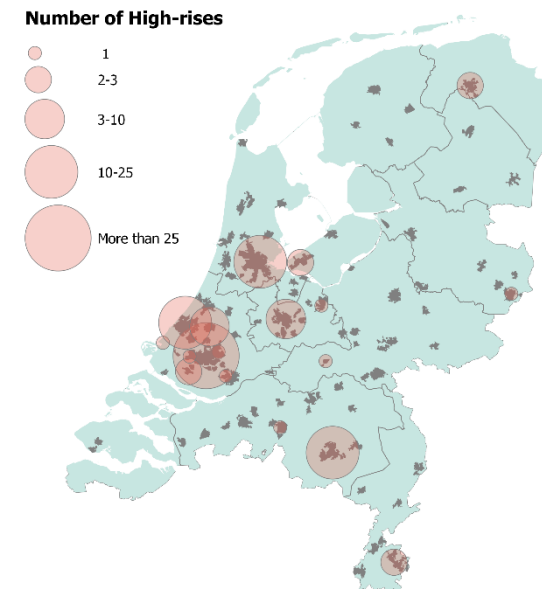


FIGURE 8: RESIDENTIAL HIGH-RISES IN THE NETHERLANDS (CTBUH, 2020)

FIGURE 9: RESIDENTIAL HIGH-RISE CONSTRUCTION (CTBUH, 2020)

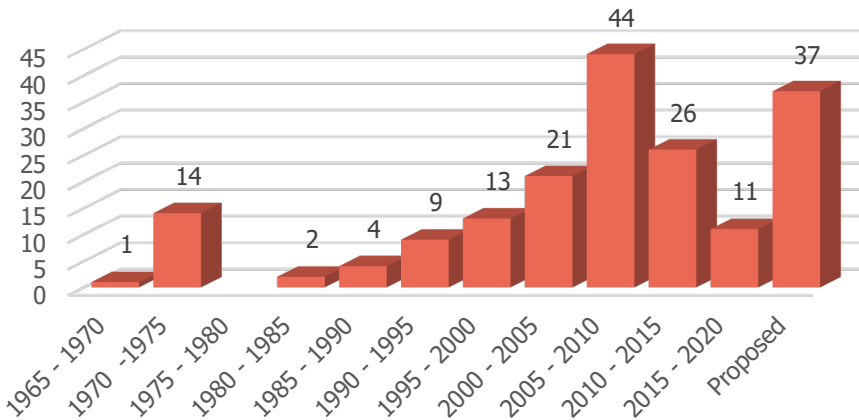
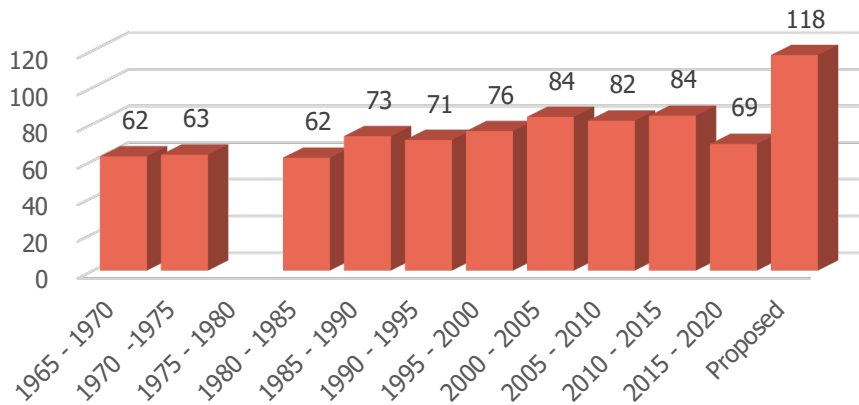


FIGURE 10: AVERAGE HEIGHT CONSTRUCTED HIGH-RISES (CTBUH, 2020)



It is important to consider that Dutch high-rises are, from an international perspective, fairly small at not enormously common (Zandbelt & van den Berg, 2008). Only Rotterdam has a tradition of high-rise construction because of the absence of a historic centre. Other cities in the Netherlands used to be more hesitant about building high-rises, to protect their historic centre. Nonetheless, these cities are now also constructing more high-rises and they are lifting or expanding their height regulations. Besides the major cities, smaller cities are constructing high-rises to accommodate the growing housing demand, like Leeuwarden, Heerlen and Tilburg.

As mentioned, the increasing number of high-rises aim to create more urban dwellings, to stop cities from sprawling. Taking this into account, it is important to consider the target demographics. People that move to suburbanized neighbourhoods are mostly people with children. If high-rises aim to counter urban sprawl, this group should, at least to some extent, be willing to live in high-rises. The NOS (2018) mentions, high-rise living should become more normalized for all groups in the Netherlands. Nonetheless, not all target demographics are not interested in high-rise living (Buck Consultants International, 2009). Table 1 displays the willingness of various demographic groups to live in a high-rise.

TABLE 2: INTEREST IN HIGH-RISE LIVING (BUCK CONSULTANTS INTERNATIONAL, 2009)

Age group	Education	Household composition			Purchase power		
		Single/cohabiting	Cohabiting with children	Single with children	High	Medium	Low
20-35	High	+++ ^	++	++	+++ ^	++ ^	+
	Medium/low	++	+	+	++	+	+
35-60	High	++	+	+	+	+	+
	Medium/low	+	+	+	+	+	+
>60	High	++ ^	+	+	++ ^	+	+
	Medium/low	+	+	+	+	+	+

In table 2, the most important target groups are marked red. Additionally, those with an upward arrow underneath are expected to grow in the coming years.

The table shows that the most important target group are young singles/cohabiting without children, with a high educational level and high purchase power. In the next 30 years, this group is expected to grow as household compositions in the Netherlands change away from the 'traditional' family. A second important target group is a relatively small, yet growing, group of elderly. These are mostly higher educated elderly that like to be close to facilities since they are less mobile than youngsters. From this we can derive that high-rise living is mostly of interest to people without children and with a high income and high education.

Whereas the results of Buck Consultants International (2009) give a valuable insight into those interested in living in a high-rise, it also pinpoints two issues. If high-rises should solve the high demand in urban areas, more groups should be interested in living in high-rises. People with children often chose to live in a low-rise neighbourhood as this is a better environment for a child. Second, singles and elderly are demographic groups that are more prone to loneliness, stretching the importance of social cohesion and interaction.

3.2 DUTCH HIGH-RISES TROUGH TIME

Although the Dutch high-rise construction is still fairly small, various construction periods can be identified. The various periods explain much about the current attitude of Dutch citizens towards high-rises.

Through the years three periods of high-rise construction are identified; (i) high-rises to rebuild, (ii) high-rises as symbol of the city and (iii) high-rises to solve housing issues (Figure 11). The latter referring to the current period. Although some high-rises were constructed before 1960, this was done on such a small scale that they are not considered as a specific period. In the following two sections, the high-rises to rebuild and high-rises as a symbol for the city periods are elaborated.

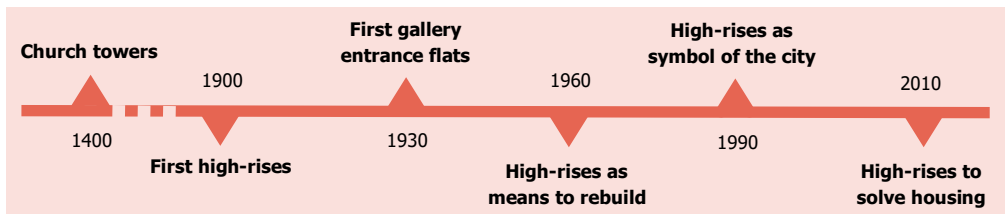


FIGURE 11: TIMELINE OF DUTCH HIGH-RISE CONSTRUCTION (ZANDBELT & VAN DEN BERG, 2008)

HIGH-RISES TO REBUILD

After WWII, there was a large housing shortage in the Netherlands that endured many years. The issue was persistent and asked for other methods than the traditional low-rise neighbourhoods. Especially in municipalities with between 50.000 to 100.000 inhabitants, more residential high-rises were built. During the '60s, total the number of buildings of more than six stories raised from 17.634 in 1962/1963 to 82.175 in 1966/1967 (Blom et al., 2004). In the same period the share of apartment buildings of more than six stories raised from 21% to 73%. According to Blom et al. (2004), there are five main reasons for the growth in high-rise construction during the '60s.

- The housing shortage
- The government-subsidized high-rise construction
- The land prices were increasing, making high-rise construction more profitable
- The increase of the automobile, building with high density created more space for infrastructure
- High-rises were seen a prestige projects, especially for smaller towns

A building of more than six stories is, especially for today's standards, not necessarily a high-rise. Moreover, it is not a high-rise according to the definition this research takes, namely, a building of more than 70 meters. However, this period of 'high-rise' construction in the sixties is important to consider since it largely influences the attitude of Dutch people towards high-rises today.

For that time, the buildings being constructed were significantly higher than the existing housing stock. Hence, the 'high-rise' construction boom of the 60's dramatically changed the cityscape in the Netherlands, especially in smaller cities. Unsurprisingly, citizens and experts were increasingly in disagreement on the high-rise construction, as living in high-rises was associated with multiple health-issues (Blom et al., 2004). Over time, high-rises were criticized more and more causing high-rise construction to suddenly stop halfway the '70s.



FIGURE 12: GALLERY ENTRANCE FLATS IN VINKHUIZEN, GRONINGEN

Although the high-rise boom ended, the Dutch cities and towns were still stuck with many 'high-rises'. These high-rises were designed in a period when building regulation became more leading than the artistic aspiration of the architects and planners. This meant that new neighbourhoods, and the high-rises within them, were uniform. They were most often gallery entrance flats, which today can be seen all over the Netherlands. These are buildings that all look like those in figure 10. The buildings all have more or less the same floorplan, that is visualized in figure 12. In this layout a large amount of apartments are aligned to a long outdoor gallery, which serves as a corridor. Most often, there are staircases and elevators located on each side of the building (Figure 13). In a layout like this almost all communal spaces are traffic spaces instead of place to stay. Traffic spaces are only used to go in and out the building in the fastest way, this creates little time for interaction. The only place where residents meet is when they are waiting for the elevator. The lack of places to stay and interact results in low social interaction and cohesion in the gallery entrance flats.



FIGURE 13: TYPICAL FLOORPLAN OF A DUTCH GALLERY ENTRANCE FLAT

The reason for this uniformity was a new building method that was developed during the '60s (Blom et al., 2004). This system was significantly less labour intensive and made building up to 14 stories easier. A precondition for this new building method was that it demanded large scale developments and a limited number of housing types. This caused the growth of the uniform gallery entrance flats. Also, this building method was subsidized by the government in the '60s. In the '70s a new government was formed that changed this policy and started closing down the factories that build large construction elements, this combined with the increasing critiques on the small high-rises marked the end of this period. Because these high-rises were highly criticized most people did not want to live in them, causing them to attract only residents with a lower socio-economic status. This caused the high-rises to deteriorate and resulted in a negative stigma on high-rises.

HIGH-RISES AS SYMBOL OF THE CITY

After the brief increase in the '60s, high-rise-development in the Netherlands nearly stopped. This was partially due to the oil crisis of the '70s and the increased critiques on high-rises. However, in the mid-'80s and beginning of the '90s, high-rises were increasing again. Opposed to earlier high-rises, the new high-rises were seen as beautification of the city.

This trend started in Rotterdam. High-rise developments in the city centre gave Rotterdam the nickname 'Manhattan on the Maas' (Maas referring to the river that runs through the city). After Rotterdam other cities followed with high-rises to create a symbol for their city, as they are seen as a sign of prosperity (Zandbelt & van den Berg, 2008). As mentioned, high-rises were not only developed in the four

largest cities anymore. Smaller cities like Leeuwarden and Tilburg were developing high-rises as well. In Tilburg, this development started with the 'Interpolis Tower'. This building was constructed in 1996 and was, at the time, the only real high-rise in the city. The architect, the same as the tower in Leeuwarden, purposely designed the tower to stand-out. The tower needed to be unavoidable. In a news article just after its completion, the tower is mentioned as:

"Currently the tower is the landmark of Tilburg, a beacon of the city, that is a symbol for its growing urban ambitions." (freely translated from Trouw, 1996)

This statement emphasizes that the 94-meter high tower is seen as a symbol for the city.

Besides the smaller cities, the large cities in the Netherlands were also undergoing the new high-rise trend. Here, the plans went even further and resulted in large high-rise neighbourhoods that aimed to put the city internationally on the map. Clear examples of this are the 'Zuidas' in Amsterdam, of which the first plans were made in 2000, and the 'Kop van Zuid' in Rotterdam, which was planned at the beginning of the '90s. Both masterplans clearly draw from international central business districts. The Zuidas is planned to be the CBP of the Netherlands and the Kop van Zuid draws its whole layout from Manhattan in New York (Figure 14).



FIGURE 14: KOP VAN ZUID, ROTTERDAM

These developments of the 1990s mainly include office towers. And whereas, this research is about residential towers this trend is vital to consider. As mentioned, the residential 'high-rises' of the '60s and '70s were not an attractive place to live. This created a negative stigma on high-rise living. The trend of the '90s, however, turned this negative image of high-rises around. The growth in high-rise office buildings facilitated the current growth of residential high-rises. If the reputation of high-rises did not improve during the '90s, the current development would be different. Today we still see high-rises that are supposed to be symbols of the city, which nowadays often include residential dwellings, as opposed to offices (NAW, 2018).

This shift from office to residential high-rises sometimes brings implications. Whereas planners and architects did not have to take social issues into account in the office towers, they are of importance in residential high-rises. If we do not want to recreate the undesirable high-rises of the '60s, developers must take a different view, with more attention to those living in the high-rise. Additionally, the office high-rises of the 1990s had become investment objects for large corporations. The towers were funded by them and rented to the occupants. When using this model in residential high-rises, the investor wants a maximum revenue. This is created by renting out as much space as possible and making the communal areas smaller, as no rent can be derived from them. This causes these high-rises to include less communal spaces where residents can meet and interact. These small communal spaces could create the same problems that are associated with the high-rise development in the '60s. The low interaction and cohesion made people feel unsafe, causing only those who had no other option to live in them, resulting in the building to deteriorate. Although current high-rises are mostly aimed at attracting rich residents, the old gallery entrance flats were also aimed to provide housing for young professionals and not people with a low socio-economic status.

As mentioned, a solution could lie in public-private partnerships. Whereas the developer is often only concerned with making a profit, the living environments of people should be about more than just making a profit. This is also the reason why Wood (2014) argues in favour of more public-private partnerships in high-rise construction. As governments do not aim to make money but want to ensure good living environments for its inhabitants. Public-private partnerships could thus

create high-rises that are less driven towards making money, but also towards creating good living environments.

3.3 CONCLUSIONS

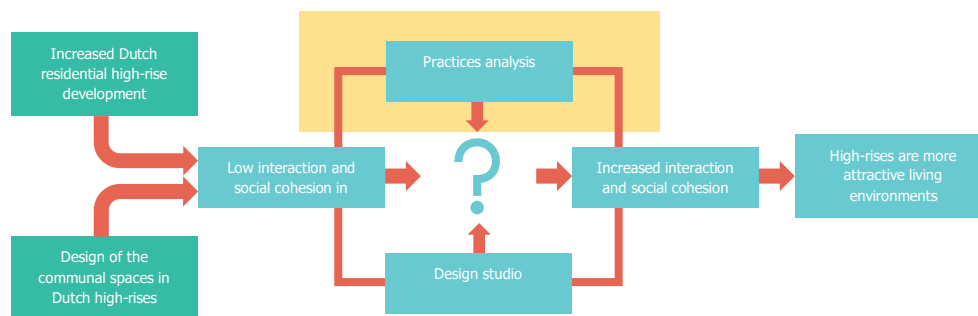
Combing the information stated about Dutch high-rises and its development, we can make some conclusions regarding the Dutch context. Currently, high-rises are meant to solve the growing demand for urban living, just as they did after the Second World War. However, high-rises are still coping with the negative reputation created during the '60s. Especially families and middle-aged people have low interest in living in a high-rise. Nonetheless, current developments have tried to improve the reputation of high-rises. High-rises are used as landmarks where people can live in. Yet, this new development also brings implications. As the developments are led by investors, the revenue they get is maximized to the full extent. There are multiple strategies investors and developers use to achieve this. First, they cut down communal spaces to have more rentable apartment space. This causes the communal spaces to be small and mostly used as traffic spaces to get out or into the building, instead of places to stay. Second, investors favour renting or selling more expensive apartments as they provide more revenue. Although more expensive apartments often do include better quality communal space, they are also exclusive places that are only for the rich. These are developments that need to be taken into account as they have a large influence on social cohesion and interaction in high-rises. Somehow, developers should take social issues into account. In the following chapters, there will be elaborated, discussed and analysed how this can be done.

5. DRAWING FROM EXPERIENCES

In this part, design features and their effects are drawn from practice. Over the years many architects have created high-rises that take social issues into account. They included a wide variety of design features that had different effects. This chapter partially answers the second sub question of this research:

"What key lessons for socially inclusive high-rise design can be derived from international practices and experts, including lessons from low-rise neighbourhoods"

Placing this chapter in the conceptual model, the practices analysis forms the first step in identifying design features that increase social interaction and cohesion. Important to consider is how these design features of buildings are different over time and how they vary across different geographical contexts. This analysis, therefore, takes buildings constructed at different times and across various places into account.



5.1 PRACTICES ANALYSIS

The following subchapter contains an analysis of 15 various practices. On the next page a visual overview is given of the different locations and construction periods of the buildings. As mentioned in the methodology all buildings are carefully selected as they take or once used novel design features that simulate social interaction. Especially the various places and ages of the buildings create a diversity in design features that improve the quality of this chapter.

Each high-rise or concept is analysed in the same manner to create a logical overview.

- First, the context of the building is described taking time and place into account.
- Second, what the building was meant to be. Discussing how and why the architect made certain design choices.
- Third, how these design features are carried out and how they work in real life.
- Fourth, an overview is given of the specific design features, their goal, and their result. Additionally, numbers in the images correspond to the specific design feature in the table.

On the next page, a visual overview of the various locations and ages of the practices (Figure 15 & 16). The images show the diversity of age and place.

FIGURE 15: LOCATION PRACTICES

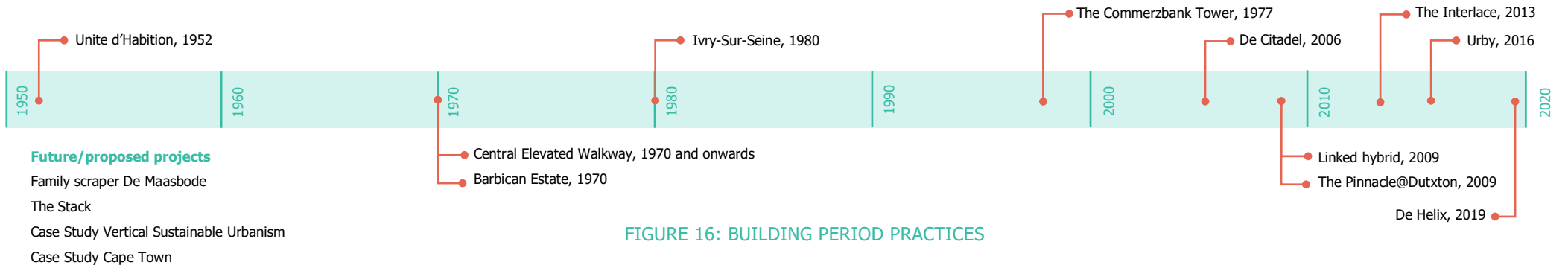


FIGURE 16: BUILDING PERIOD PRACTICES

IVRY-SUR-SEINE, PARIS



Key facts

Architect(s): Jean Renaudie & Renée Gailhoustet | Building year: 1980 | Height: -

Context

Ivry-sur-seine is a suburb of Paris located around five kilometres from the city centre of Paris. The suburb has around 60.000 inhabitants. Politically, Ivry-sur-Seine is considered a “banlieues rouges” meaning it has historically demonstrated strong electoral support for the French Communist Party (PCF). One of the particularities of such municipalities is to bring a significant emphasis on social and affordable housing to accommodate their population, often in a situation of economic precariousness.

What was meant to be?

The urban housing concept approached to take the function as a space to welcome the urban life of the resident, not to offer the physical provision of housing repeating the simple housing unity. The architects accentuated the social

role of the housing project not only as of the level of a personal home but also as that of urbanism. They offered a diverse choice opportunity to the citizen by the urban functional complex through their efforts to make characteristic complex of urban housing. Additionally, they used a diffuse public-private space relation to create a greater sense of belonging, just as Gehl (2011) describes. Finally, the design feature that immediately catches once eye are the urban gardens. The architects wanted to make gardens available to everyone. Besides that they are private the balconies also create a human scale, as one can see into multiple balconies from various places.

What it is?

The maintenance of the building, the age and the closing of shops inside the commercial zone of Jeanne Hachette became a problem, not only that of physical amelioration but also that of spiritual conservation of the works of architect Jean Renaudie. Besides the closing of shops the lack of diversity in residents caused problems. The houses are mainly social rental properties. This is a group that is generally less concerned with the upkeep of public spaces, compared to people that buy a house. Yet, although the public space does not suggest it, there is a strong sense of community among the inhabitants. Especially those who lived in the houses since they were built. They show a strong attachment to the architectural style.

Design feature	Goal	Result
1. Urban gardens	Provide everyone with outside space	Most gardens are not well maintained
2. Each house is different	Provide suitable housing for every individual's needs	Often unusual spaces, which are not suited for everyone
3. Diffuse public-private space	The diffuse public-private relations should create a greater sense of belonging and community	Because nobody properly maintains the public space, they became detreated and unsafe places.

Source: Dae-Seung (2012)

THE INTERLACE, SINGAPORE



Key facts

Architect(s): RSP Architects Planners & Engineers | Building year: 2013 | Height: 80m

Context

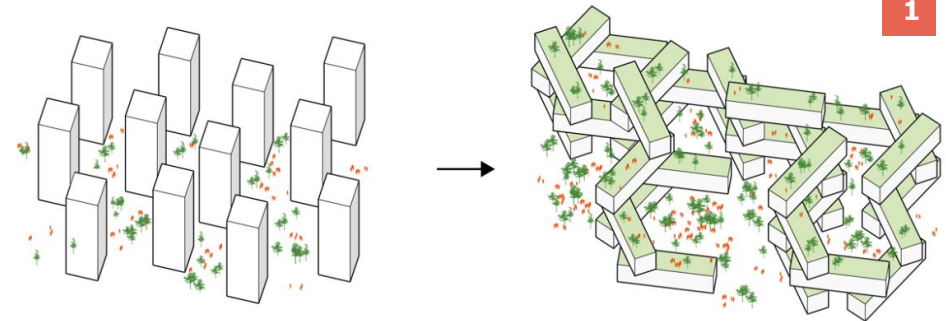
The Interlace is a large housing project in Singapore. Singapore is a densely populated city-state with a large number of building regulations and a strong planning tradition. These regulations are set in place to ensure a liveable city on the limited amount of space they have. The architect, Ole Scheeren, was given the task to design a thousand houses on an 8-hectare plot of land with a height limit of 25 stories. The Interlace takes an extraordinary approach by not building sole-standing high-rises, but flipping the high-rises and staging them on top of each other. In doing so, the architect created many public and private outdoor areas.

What it was meant to be?

The Interlace presents a radically new approach to contemporary living in a tropical environment. Instead of creating a cluster of isolated, vertical towers the design proposes an intricate network of living and social spaces integrated with the natural environment. The project generates ample communal spaces,

opportunities for social interaction and shared activities while also providing intimate spaces of privacy and quietness – simultaneously fostering a sense of community and maintaining individuality and identity.

What it is?



The Interlace is a rather newly developed complex, hence, the effects the building has on social relations are not clear yet. However, we can already mention several outcomes of the building. In 2015, just after its completion, the building won the World Building of the Year award. This is the architecture world's equivalent of the Oscars.

Design feature	Goal	Result
1. Urban gardens	Use the tropical surrounding to create green spaces, each with a specific theme	Each garden has different gradients of privacy and sharing, contributing to the sense of community. Additionally, the gardens provide an aggregated 112% green area – more than the size of the unbuild site.
2. Facilities	There are a variety of facilities for residents including; pools, a clubhouse, a theatre, etc.	These amenities create the feeling of a vertical village.

Source: OMA (2019); Urban Hub (2016); Büro Ole Scheeren (2013)

THE PINNACLE@DUXTON, SINGAPORE



Key facts

Architect(s): RSP Architects Planners & Engineers | Building year: 2009 | Height: 160m

Context

Located in the same city as The Interlace, the Pinnacle@Duxton has many equal contextual features as The Interlace. The Pinnacle is located more in the downtown area of Singapore. Due to this downtown location, the Pinnacle has a very high density, with 1,848 apartments on 2.5 hectares. These apartments are located in seven towers that are linked by sky bridges.

What it was meant to be?

The Pinnacle hosts two key design features aimed to enhance social interaction; Skybridges and changeable units. Two large bridges connect the seven towers at both the 26th and the 50th floor. These sky gardens together form almost one hectare of new land. They are designed with children playgrounds, an outdoor fitness gym for the elderly and landscape furniture; they provide diverse, creative and unusual spaces for community interaction. The sky garden on the 26th floor is for residents only and the sky garden on the 50th floor provides access to visitors.



The second design feature is changeable units. To take individual needs and changing households into account, the pre-cast flat slab system and structural column zoning allow for flexibility of wall placement in lightweight concrete. This means rooms can contract or expand to suit the occupants.

What it is?

The sky bridges create a sense of human scale while living in a high-density high-rise. Samant and His-En (2017) studied the effectiveness of the sky bridges on encouraging active usage and social interaction. They concluded that diversity in scale and design characteristics provide more opportunities for residents to use the sky gardens. The interlace takes good care of this by offering a wide array of facilities on the sky gardens. Additionally, usability is maximized by organizing activities on the sky gardens.

Design feature	Goal	Result
1. Sky bridges/gardens	Lift the public space and create places where residents can meet and interact.	The sky gardens are well used and attract a large number of visitors. There are, however, strict rules users must follow
2. Changeable units	The changeable units should ensure residents to live longer in the buildings, as they can easily adapt it their current wishes	As the development is rather new, it is not known yet if people indeed stay longer inside a house.

Source: Samant and His-En (2017)

THE COMMERZBANK TOWER, FRANKFURT



Key facts

Architect(s): Norman foster | Building year: 1997 | Height: 298m

Context

The Commerzbank Tower is located in Frankfurt am Main in Germany. It is the fifth-largest city in Germany and is home to the European Central Bank. Because of this, the city has become the financial capital of Germany and it plays an important role in the financial system of Europe. Frankfurt has become a global city that is renowned in Europe for its high-rises, giving in the nickname Manhattan. In the Bankenviertel most high-rises of Frankfurt are located, buildings than mainly have an office function. The Commerzbank Tower is the highest tower in Frankfurt.

What was it meant to be?

As opposed to most high-rises we use in this analysis, the Commerzbank Tower is not a residential high-rise. Yet, it displays some design features that are also of

significance to residential high-rises. The tower is the world's first ecological office tower. Central to this concept is a reliance on natural systems of lighting and ventilation. Every office is daylit and has openable windows. Additionally, gardens spiral up around the atrium to become the visual and social focus for four-storey office clusters. Socially, these gardens form focal points for village-like clusters of offices, providing places to meet colleagues or relax during breaks.

The tower has a distinctive presence on the Frankfurt skyline but is also anchored into the lower-scale city fabric, through the restoration and sensitive rebuilding of the perimeter structures to reinforce the original scale of the block

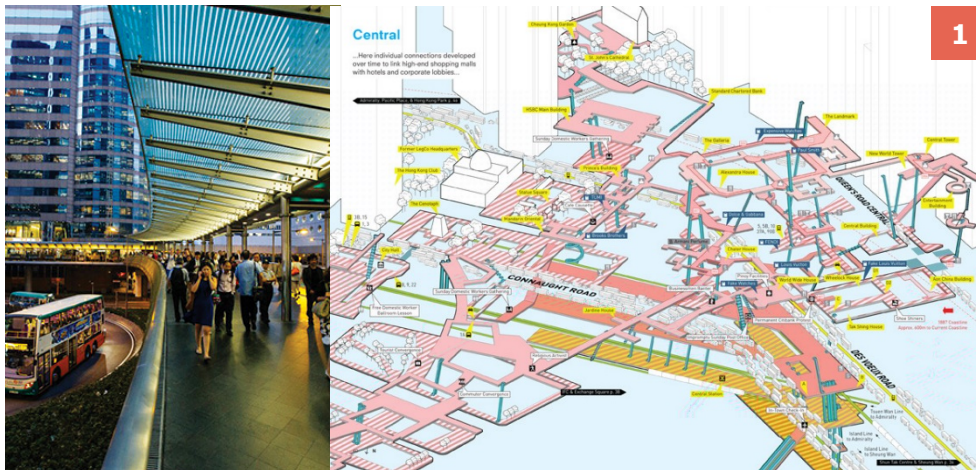
What it is?

Right after its completion, the Commerzbank Tower was adopted by the financial times as the symbol of Frankfurt. Additionally, the building has won several architectural awards. Emphasizing the building does not only work from an esthetical point of view but also the design of the inside works.

Design feature	Goal	Result
1. Central gardens	Create a village-like atmosphere where people can meet in the gardens that are in proximity to their level.	The gardens are great places to meet and heavily used by the people working in the building.

Source: Foster+Partners (2019)

ELEVATED CENTRAL WALKWAY, HONG KONG



Key facts

Architect(s): various | Building year: 1970's and onwards | Height: -

Context

Hong Kong is one of the most densely populated cities in the world. Additionally, the city has one of the highest concentrations of high-rises in the world. The reasons for the dense population and large construction of high-rises are similar to those in Singapore. As a former British colony, Hong Kong semi-autonomous region within China. The city only has a limited amount of space, hence the government chooses to create high-density living spaces. Additionally, the city government controls the developmental sites in the city and does not often supply new developmental land, keeping the land prices high. This is a business model for the city to generate income. Because of the high land prices, it is more profitable to build high-rises.

What was it meant to be?

Because of the large clustering of high-rises, Hong Kong has created a large network of pathways that connect the high-rises. These pathways are present in

many places, but the Central Elevated Walkway forms the largest network. This pathway separates pedestrians from other modes of transport. Whereas roads usually disconnect high-rises from each other the elevated walkway connects them, lifting the public space into the air. The walkways provide a relaxing and safe environment to walk in, free from worry about the vehicle traffic. And for the most part, they lead to popular destinations: MTR and other transport exchanges, office buildings, shopping malls or residential developments. The map to the right, of the central district, is just one of 32 maps that are made of the elevated walkways in Hong Kong, all evenly complex.

What it is?

The Central Elevated Walkway is essentially a piece of infrastructure connecting buildings. However, the function and meaning of it have shifted towards a legitimate public space. The labyrinth of pathways has become a surrogate for the parks and public squares, an idea many other cities are familiar with. This network of shared space has become so vital to the public that city laws require many premises to keep their portion open around the clock, regardless of business hours.

Design feature	Goal	Result
1. Connecting high-rises	Create a segregated aerial walkway that allows for safe and comfortable pathways through the city.	The network provides a social space for the residents of Hong Kong, create a new Urban fabric away from the ground floor.

Source: Soloman et al. (2012); Arch Daily (2013)

UNITÉ D'HABITATION, MARSEILLE



Key facts

Architect(s): Le Corbusier | Building year: 1952 | Height: 56m

Context

The Unité d' Habitation was built just after the Second World War. The building was meant to house French families that were dislocated because of the war. The building can be seen as one of the earliest modernist pieces of architecture that focus on how buildings and planning can create society. Additionally, the building is seen as the start of brutalism, by its abundant use of concrete.

What was it meant to be?

With the building, Le Corbusier aimed to create a new type of social space. The goal was that the building would create a community. The Unité d' Habitation is essentially a "city within a city" that is spatially, as well as, functionally optimized for the residents. The building is designed so the inhabitants have their own private spaces, but outside of that private sector they would shop, eat, exercise, and gather together. Most common facilities are placed on the roofs.

The roof became a garden terrace that has a running track, a club, a kindergarten, a gym, and a shallow pool.

What it is?

The Unité d' Habitation is a building that had a large impact on how we perceive residential buildings. The building is seen by some as a prime example of public housing across the world. However, there are also critics of the building. Mostly because the building forms a closed system, that has low interaction with the outside. The building assumes that a community can be created by geographical isolation. The building sucks up all facilities that used to be within the streets. Whereas streets were places for unforced social interaction, the corridors within the Unité d' Habitation are not.

Design feature	Goal	Result
1. Place facilities on the roof	Create a community by including facilities into the residential buildings.	The facilities on the roof are only accessible to residents. Hence the facilities are not available for non-residents.
2. Vertical garden city	Construct high-rises in green space, to create high density in a green area.	.

Source: Engel (1994); Arch Daily (2010)

BARBICAN ESTATE, LONDON



Key facts

Architect(s): Chamberlin, Powell and Bon | Building year: 1960/70 | Height: 123m

Context

The Barbican estate is a large housing complex located in central London. The complex is located in an area that was heavily bombed during the Second World War and thus needed to be redesigned afterwards. Today the area contains many financial institutions, but also the Barbican estate residential complexes, with its facilities. The location of the complex, in central London, is key in the understanding of the popularity of the houses.

What was it meant to be?

The Barbican estate is a prime example of brutalist and modern architecture. The complex was designed to house city professionals and their families. To create a pleasant environment where people can meet there is no vehicle access within the estate. The whole complex is placed on a podium, where vehicles run underneath but not on top. On the podium, there are many parks and lakes to create a

pleasant public space. Additionally, high-end facilities were placed to attract middle and high-class residents.

What it is?

There are mixed opinions about the Barbican estate. Some inhabitants love the architecture and complexity of the place. However, there is also a large group that sees it as a less successful project. Most likely this has to do with the architecture style. The brutalist architecture is characterized by the usage of rough concrete. This compared with the scale of the project makes some people feel estranged. For example, the painting on the first page of this thesis is a depiction of the Barbican estate as a negative place. The Barbican estate is an expensive place to live, indicating there is a large demand to live in the complex. According to some, this mostly has to do with the favourable location.

Design feature	Goal	Result
1. Exclude vehicles	The exclusion of vehicles aims to make the public space pleasant, allowing for more people on the street.	The absence of vehicles works, however, there are still not many people on the street.
2. Brutalist architecture	The brutalist architecture was a popular style during the '50s and '60s as it showed strength. For the recently bombed Barbican estate sight this was a reasonable architecture style	Whereas the plan for the Barbican estate complex was good and carefully considered, the architecture style makes it feel rather inhuman and unwelcoming. Two characteristics that do not contribute to social interaction.

Source: Barbican Living (2018); Architecture Daily (2016)

LINKED HYBRID, BEIJING



Key facts

Architect(s): Steven Holl | Building year: 2009 | Height: 68m

Context

The Linked Hybrid is located in the capital of China, Beijing. This city is growing at a rapid pace and sees a large increase in high-rises. Most high-rises in Beijing, and China, form closed communities. They are often monofunctional and have little connection to the outside space. Hence, they do not form great places for interaction and social cohesion.

What was it meant to be?

The Linked Hybrid was meant to create an "open city within a city". The architect aimed to create a new twenty-first-century porous urban space, inviting and open to the public from every side. The complex, consisting of eight towers connected by sky bridges, promotes interactive relations and encounters in the public space. The entire complex is a three-dimensional urban space in which buildings on the ground, under the ground and over the ground are fused together. The connections between the buildings account for extra floor space, accommodating

popular activities and maintaining the continuity of community spaces, as a street does in a horizontal development. Besides the gardens, the complex also takes diversity into account, both in amenities and dwellings. The architect wanted to counter standardized reparative housing schemes which are historically common in China. Hence, the complex contains hundreds of different apartment layouts.

What it is?

The Linked Hybrid is an extraordinary and innovative piece of architecture, hence, it was awarded the best tall building in Asia and Australia in 2009. However, the building also has its fair share of criticisms. Whereas the building should create an open space where everyone can have spontaneous interactions, some argue the complex is a fortress for the rich that has no connection to the outside. The apartments in the complex are expensive, thus they only attract rich residents. Additionally, some say the towers are too focussed on each other and the internal garden, but not to the area outside of the complex, they mention it has some features of a gated community. The architect disagrees and says the building and its green space are open to everyone and the retail shops also rely on visitors.

Design feature	Goal	Result
1. Sky bridges	The sky bridges aim to create a three-dimension public space, with a street of amenities located in the sky.	The complex mostly houses rich people, hence, the facilities in the towers do not feel like they are open to everyone even though they are publicly accessible.
2. Open city within a city	The complex should become a public space where there is a possibility for spontaneous interactions.	Some argue the architecture of the complex is inward-focused and has no relation to the surrounding space, hence it feels like a gated community instead of an open city.
3. Different apartments	The complex contains hundreds of different apartments aimed to house various types of residents	The apartments are expensive (up to 6000€ sq. m). This causes the resident mix to be limited.

Source: CNN (2008); Dezeen (2008); Modi (2014); Arch Daily (2009)

DE CITADEL, ALMERE



Key facts

Architect(s): Christian de Portzamparc I | Building year: 2006 | Height: -

Context

Almere is one of the newest cities in the Netherlands. The city is constructed on land that was reclaimed from the sea. Hence, it was for urban planners an open space where they could create a new city. As a consequence and as opposed to many other Dutch cities, Almere has no historical core. Allowing the center of the city to be newly developed.

What was it meant to be?

The Citadel forms the core of the inner city of Almere. It is a square block of 130 by 130 meters. The block is subdivided into four smaller blocks by two streets intersect in the middle. Along these streets, shops are located. Walking on the street one would hardly know what lies on top of the four blocks. On the roof of the stores, a new ground level is created that feels like a small village of 46 houses and a small apartment complex surrounded by a green park. By the staging of different functions, space is used optimally. Below the complex the real ground

level can be found, which houses a parking garage, then on the second ground level, a shopping district is located, which is topped by a small village-like housing development. This architecture takes the Dutch scale into account and creates an intimate living environment for the residents.

What is it?

Although the Citadel is not really a high-rise it does show an innovative way of lifting the public space, creating a new ground level. This way of organizing a multi-layered building creates a spacious almost village-like neighbourhood in the centre of one of the largest cities in the Netherlands. This innovative design caused the citadel to be awarded the title of the best building in Almere in 2006.

Design feature	Goal	Result
1. Multi-layered building	In the citadel there is a clear division between parking spaces, retail space and residential space. This clear division creates optimal surroundings for each function.	The clear division between functions can sometimes be a questionable undertaking, as history taught us it did not always work. However, in the case of the citadel, the proportions and context are good, creating a unique place.
2. Create different ground levels	Creating different ground levels causes the same space to be used to the full extend multiple times.	The multiple ground levels create clear distinctions between the different functions. This allows for one space to both include a busy shopping street and a village-like residential neighbourhood.

Source: Stedenbouw en Architectuur (2011); E-architect (2008)

FAMILY SCRAPER DE MAASBODE, ROTTERDAM



Key facts

Architect(s): Bergen Kolpa architects | Building year: under construction | Height: 70m

Context

The Family Scraper De Maasbode is located in Rotterdam in the Netherlands. Rotterdam is often referred to as the high-rise city of the Netherlands. Because it was heavily bombed during the Second World War the city lacks a historic city centre, causing there to be fewer regulations on high-rises. Additionally, the city is home to the largest harbour in Europe and houses a lot of international companies. This is also a reason why high-rises are used to create a more global atmosphere.

What was it meant to be?

The family scraper provides an answer to the suburbanization of Rotterdam. The building is designed to create an alternative for living in the suburbs. It can be seen as a stacked suburb with triplex single-family homes build along a communal residential area (Dutch; woonerf). The goal of this design is to create a sense of

community. By giving more room to the traffic spaces in high-rises, more places for spontaneous interaction arise. From the elevator one will enter a six-meter wide and nine-meter high 'street', that feels and looks like a real street. These extra spaces will contribute to the living climate in the high-rise. Nevertheless, extra space comes with extra costs, which the residents will eventually pay for, meaning the houses will be in the higher segment of the market. However, consideration has been given to variety of residents. The lower floors contain apartments for those who want to be more in touch with the city life below. The dwellings in the middle make up the largest part and contain the three-story family dwellings. Finally, the top floors contain loft dwellings for those who like urban views and value the communal space less.

What is it?

As the building has not been constructed yet, we cannot discuss what the building is and what the results of the design features are. Yet, the building takes a different approach to high-rise construction making it an exceptional example.

Design feature	Goal	Result
1. Triplex dwellings for single families	The sizes of the dwellings should make the high-rise a suitable alternative for low-rise neighbourhoods	-
2. Street-like public space	The large street-like public space should create a feeling of living on a normal street, where people play and interact. By designing the space with a brick floor, trees and real front doors it should get a real street-like feel.	-

Source; de Volkskrant (2019); Bergen Kolpa Architecten (2019)

CASE STUDY VERTICAL SUSTAINABLE URBANISM



Key facts

Architect(s): - | Building year: - | Height: up to 500m

Context

Besides Johannesburg, Cape Town is the largest city in South-Africa. Additionally, it is the second most important economic core of South-Africa. The city, just like the rest of South-Africa, is characterized by large income differences. One of the biggest causes of this is the former apartheid. Apartheid Spatial Planning has left a legacy that shaped and is still shaping Cape Town in a way that only perpetuates the inequalities plaguing society. However, planning could also be a solution to these disparities.

What was it meant to be?

The building is a non-existing case study made by a team of architects that attempt to take a new approach to sustainable vertical urbanism. In their building design,

they take multiple design features into account that should create a social high-rise. First, the apartments are easily adaptable to ensure the apartments can grow with the residents. As the apartments are decoupled from the structure they can be enlarged or made smaller to suit the need of the residents. This ensures people do not need to move so they can stay in the same place and grow their social network. The high-rise also includes different dwelling sizes, to ensure a mixed population. Additionally, six sky gardens adorn the building (the number depending on the height of the tower). Just as we have seen in the other buildings, the sky gardens are designed to encourage interaction. By including a sky garden, the ground floor is lifted to multiple levels creating places to meet, relax and play in contact with nature. Additionally, the multiple sky gardens work as a barrier between multiple smaller neighbourhood within the vertical city. This ensures a more human scale to living in a large high-rise.

What is it?

As the building has not been constructed yet, we cannot discuss what the building is and what the results of the design features are. Yet, the building takes a different approach to high-rise construction making it an interesting example.

Design feature	Goal	Result
1. Apartments are decoupled from structure	This allows the houses to be able to change with the life of the residents and it creates a less standardized feeling which is often associated with high-rise living.	-
2. Various apartment sizes	Create a mix of residents that are more representative of society.	-
3. Sky gardens	The sky gardens are places of interactions where residents can meet relax and play. Additionally there create neighbourhood-like structure within the high-rise.	-

Source: Mann et al. (2014)

URBY, JERSEY CITY



Key facts

Architect(s): Concrete | Building year: 2016 | Height: 200m

Context

The Urby apartments in Jersey City are part of the larger Urby concept that also has buildings in Staten Island, Harrison and Stamford, which are all located in or in proximity to New York. New York is known around the world for its high rental prices. The buildings or Urby are located in suburban areas to offer good quality cheaper alternatives to living in the centre of New York. Urby apartments in Jersey City is also designed to offer housing for people who spend most of their time in New York, as the city is located near the ferry.

What was it meant to be?

The Urby apartments in Jersey City was already mentioned in the community building section in paragraph 2.3. The Urby concept takes two different views on social inclusive high-rise design. First, as has been discussed, the Urby concept takes an innovative view on facilities. The building offers many shared facilities which should create places where people can meet. Facilities within high-rises are

common, however, the Urby concept substitutes these facilities with active programs. This causes communal spaces to be used more often, leading to more interaction. By actively promoting and planning a variety of activities there are activities for everyone where residents can meet neighbours with the same interests. Second, the building is designed to feel like home. The building does, for example, not have a lobby but the entrance is formed by a café, where locals and residents can meet. Additionally, there is a whole floor reserved for residents only communal areas.

What it is?

The Urby concept is popular with new buildings of the company opening and being build outside the original metropolitan New York area. The concept is especially suitable for young professionals who seek an affordable apartment with modern amenities that have an easy commute to the city. As Urby apartments are located further from the city centre land can be bought cheaper. This money can be invested in creating a more high-end living environment. Urby buildings, like the one in Jersey City, are located near mass transit, ensuring a fast connection between the city and the Urby building. There is however a downside to this. Except for the café entrance, the building's amenities are only accessible to residents. Additionally, as the Urby buildings are focussed on a fast connection to the urban centres one can ask questions about the effects the buildings have on the neighbourhood. As the buildings are essentially a gated community, locals do not benefit from the new developments.

Design feature	Goal	Result
1. Active programming	Ensure that the communal spaces are used on a regular basis. Additionally, local teachers or artists guide the workshops.	Unfortunately ,there is no information about participation in the programmed activities.
2. Café entrance	Create an instant homely feel when you enter the door. Additionally, it is a place where locals and residents can interact	Although the café is a great place to interact. The other facilities in the building are for residents only, which leads to exclusionary landscapes

Source: New York Spaces (2017); Volkskrant (2016); Forbes (2017)

THE HELIX, GRONINGEN

1



Helix met
collectieve
ruimten



Key facts

Architect(s): De Unie Architects | Building year: 2019 | Height: 70m

Context

The Helix is located in the city of Groningen in the Netherlands. Groningen is not known for its high-rises within the Netherlands, however, just as other Dutch cities, it has seen a remarkable high-rise growth. Many of the newest high-rises suit one goal, provide housing to students. Groningen is one of the most popular student cities in the Netherlands, hence there is a constant demand for student housing. In the city, high-rises are used as a means to solve the shortage of student housing. There are two main reasons for this. First, the local government wants to discourage studentification of city neighbourhoods. Second, the city is not allowed to expand beyond its current borders. The spurts the construction of high-rises on carefully selected empty plots.

What is it meant to be?

Most student housing high-rises try to make public spaces as small as possible to generate more rent. The Helix, however, takes a different approach. On every

floor, there is a space reserved for collective facilities. As these spaces spiral within the nine-cornered tower, they form a vertical street. The facilities are maintained by the residents and they can choose which facilities they want. Additionally, some spaces can also be rented out to external parties. This creates a communal space that residents can control themselves creating a sense of ownership. Additionally, the first three floors of the building form a publicly accessible market square. This allows the building to be less exclusionary.

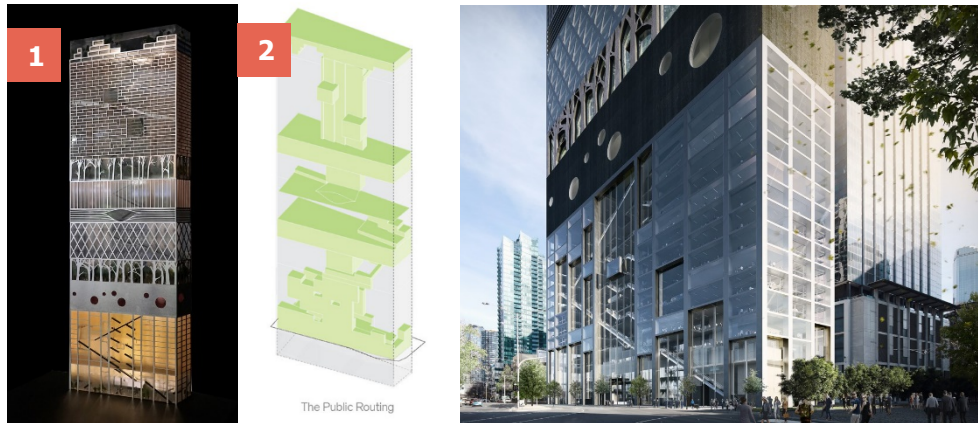
What is it?

As the building just finished and not inhabited yet, we cannot discuss what the building is and what the results of the design features are. Yet, the building takes a different approach to high-rise construction making it an interesting example.

Design feature	Goal	Result
1. Vertical street	The vertical public street creates a meeting place for residents on every floor instead of one centralized public space on one floor. This will create more interaction with your direct neighbours.	-
2. Residents can decide how the public space is used	The residents can decide how they will use the public space. This will create a usage that fits their needs better, but it will also create a greater sense of ownership.	-

Source: Comfort partners (2019); Architectenweb (2018); De Unie Architecten (2018)

THE STACK, MELBOURNE



Key facts

Architect(s): De MVRDV | Building year: - | Height: 359m

Context

The Stack is a proposed skyscraper in Melbourne's Southbank. The high-rise is supposed to be a "new kind of skyscraper". Melbourne's Southbank is currently dominated by car traffic. The sidewalks are narrow and there is a lack of greenery. MVRDV and Woods Bagot envision to transform Southbank into a lifestyle precinct of exceptional standards. The tower is tall but also human in scale, urban but also green. Additionally, the tower has a high proposition of publicly accessible spaces.

What is it meant to be?

The Stack is, opposed to other skyscrapers at the Southbank, multifunctional. It is designed as a stack of neighbourhoods including offices, residential, hotel, retail and entertainment, which are connected by four publicly accessible gardens. The staging of functions allows the tower to create a very high density, making the most use of the limited urban land.

A second key feature of The Stack is a large amount of publicly accessible space. This ensures the building truly is a vertical city. Inside the building, there are interconnected public spaces that connect the various functional zones. Footpaths are wide so people can walk and sit on the terraces to interact. Although the residential part is not publicly accessible, there are public spaces located underneath and above the residential 'stack'. This allows for public space to be in close proximity while remaining privacy.

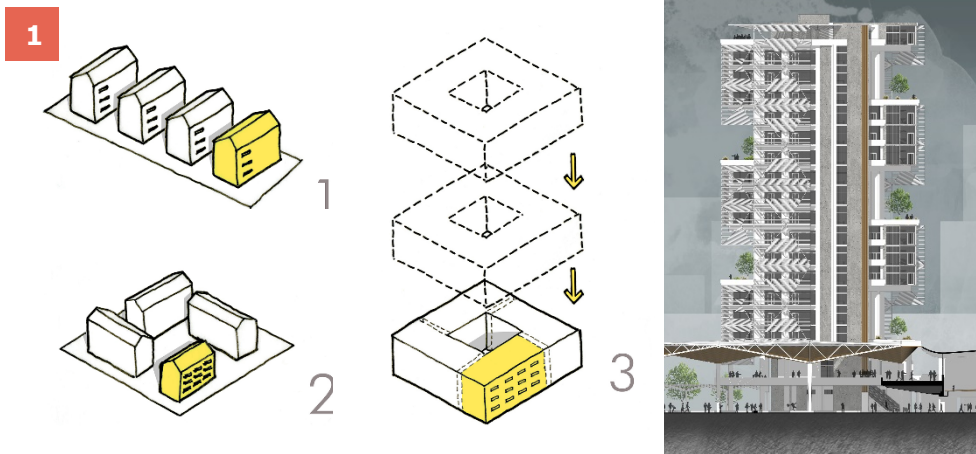
What is it?

As the building has not been constructed yet, we cannot discuss what the building is and what the results of the design features are. Yet, the building takes a different approach to high-rise construction making it an interesting example.

Design feature	Goal	Result
1. Multifunctional stacks	The incorporation and staging of different functions allow for many visitors within the building, additionally, it creates more places to meet. As the various functions are staged on top of each other there is a clear distinction between them, however, they are always nearby	-
2. A large share of public spaces	As the various functional stacks, of which a large share of public facilities, are placed on top of each other they need to be connected by public spaces. The building offers a generous amount of public spaces spread across the whole building. These spaces are carefully designed to be places to stay and interact and not just move through	-

Source: MVRDV (2019); World Architecture (2018)

CASE STUDY CAPE TOWN



Key facts

Architect(s): Jochen Schmidt von Wüllisch | Building year: - | Height: -

Context

Cape Town is besides Johannesburg the largest city in South-Africa. Additionally, it is the second most important economic core of South-Africa. The city is, just like the rest of South-Africa, characterized by large income differences. One of the biggest causes of this is the former apartheid. Apartheid Spatial Planning has left a legacy that shaped and is still shaping Cape Town in a way that only perpetuates the inequalities plaguing society. However, planning could also be a solution to the disparities.

What is it meant to be?

The Case study in cape town is aimed at synthesising a design method that allows professionals to utilize architecture as a social tool to create public spaces that facilitate the evolution of collective identities of South Africans. Spaces that lend themselves to bringing people together during their everyday lives, spaces for exchange, spaces for engagement. The case study shows how we can use

residential developments in our cities to bring people back together into one space.

The building especially takes social mixing and creating a human scale neighbourhood-like high-rise into account. The neighbourhood-like environment is created by staging multiple neighbourhoods on top of each other. The concept of this residential tower is relatively simple. It is derived from taking a row of three storey-buildings in a linear arrangement and re-arranging them in a courtyard. This arrangement could then be transformed into a cell which is a fairly standard layout. These cells are then staged upon each other. The idea of splitting the overall high-rise building into smaller cells is aimed at bringing down the scale of the communities within the building and thus supporting a smaller communal engagement amongst tenants. Each cell would follow the idea of blending market-rate apartments with affordable units, as well as subsidized social housing. This would avoid the temptation to locate the richer tenants at the top of the building, and affordable/social housing tenants at the bottom, resulting in less social mixing.

What is it?

As the building has not been constructed yet, we cannot discuss what the building is and what the results of the design features are. Yet, the building takes a different approach to high-rise construction making it an interesting example.

Design feature	Goal	Result
1. Staging different neighbourhoods	But not creating one large high-rise, but subdividing it into multiple three-story parts, residents maintain a neighbourhood-like environment. The clear demarcation of a neighbourhood makes the high-rise more human scale and can result in more interaction.	-
2. Ensure each neighbourhood in equally socially mixed	If the high-rise is subdivided into various 'neighbourhoods' each neighbourhood should have equal social mixing. If all richer people would live on the higher floors, which often is the case, there would still not be any social mixing.	-

Source: Our Future Cities (2017)

5.2 CONCLUSIONS PRACTICES ANALYSIS

Having analysed 15 different projects from various geographical places and different periods we can start to explore some key design lessons. In total five lessons are identified that seemed to have a positive effect on social cohesion in high-rises. In this section, we will elaborate on these design lessons and connect them to the literature. The lessons are:

- Lift public space
- Active programming
- Multifunctional and various apartments
- Connect individual high-rises
- Create a street-like environment

Before these lessons are explained a short elaboration on the practices used in this analysis is required. First, the different periods in which the high-rises were built, each period distinguished by different practices. Interestingly, there are two main periods in which most high-rises that take social issues into account were built: the 1970's and the after 2010. In these two periods increased economic welfare allowed for greater consideration of social issues in the construction in skyscrapers. Additionally, future and proposed buildings are included in the analysis. While these conceptual buildings may have large ambitions, but are not necessarily economically viable. Nonetheless, these concepts provide valuable and innovative design ideas.

Taken the geographical distribution into account we can see the largest amount of practices are located in Asian and European countries, as these are more socially oriented countries when compared to Arabian and American countries. The lack of African examples has to do with the lack of high-rises on this continent and economic reasons, African countries often do not have the funds to invest in more expensive socially-oriented high-rises.

LIFT THE PUBLIC SPACE



High-rises that use this

- The interlace
- Pinnacle@Duxton
- Central Elevated Walkway
- Linked Hybrid
- De Citadel
- Family scraper
- Case Study Sustainable Vertical Urbanism
- De Helix
- The Stack

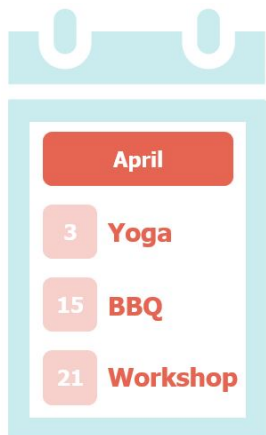
The first, and most used, design element that is derived from practices is lifting the public space. This can relate to various ways of lifting the public space. Inside or outside the building and openly accessible or only to residents. However, one thing it will always do is bring spaces for interaction inside the building. This can, for example, be a rooftop garden only accessible to residents, like the Interlace, or it can be a public path through the high-rise that connect different functional zones of the high-rise, like the Stack.

As mentioned lifting the public space is key as it creates more places for interaction. When a person lives on the 16th story of a high-rise this person has little connection to the ground floor below. If the public space is lifted to every ten floors of the building the person on the 16th floor has more connection to this public space that is in closer proximity and will use it more frequently. Looking at the public accessibility of this public space, many buildings take a different approach. It might be favourable for the quality of the interaction that the public space is accessible for everyone. As this creates a more street-like environment where spontaneous interactions are allowed to occur (Jacobs, 1961). Though, most often the public space is only accessible for residents. This is most often the case because of privacy and practical issues like destruction and maintenance. Only including private-public spaces is however not beneficial for the quality of the interaction (Atkinson & Bland, 2005). What can be observed from the practice

analysis is that there is often a mix between publicly accessible spaces and spaces that are only accessible to residents. The Pinnacle@Dutxton, for example, has two sky bridges of which the top one is accessible to everyone and the lower one only for residents. This creates a combination of spaces where people can interact with residents and with everyone. This relates to the ideas of Gehl (2011; 2014). He mentions there should be a mixture of public and semi-public spaces. These semi-public spaces, only accessible to residents provide safer environments where people more easily interact with neighbours.

A final concept lesson relates to how public space is designed. The public space in the Linked Hybrid is accessible for everyone, however, critics say it is only meant for the rich, making others to feel out of place. If this is the case then it doesn't matter that everyone can use the public space, since it will only be used by a certain group. Nonetheless, it can be stated that lifting the public space is a design method that is often used and seems to have positive impacts on social interaction.

ACTIVE PROGRAMMING



High-rises that use this

- Urby
- Pinnacle@Duxton

The second design principle is active programming. This addresses the issue that public spaces are not used. As high-rises include many residents it makes sense to organize activities that residents can attend, just like a neighbourhood

organization would do. During these activities, a person can meet their neighbours. Out of these interactions new and better relations can emerge which improves social cohesion. Additionally, it often is the case that communal spaces within a high-rise are not heavily used, active programming can be a solution to this. Better usage of the communal spaces makes them more attractive, as they feel safer (Gehl 2011; Jacobs, 1961). Additionally, if residents attend the activities revenue can be generated that supports the maintenance of the communal spaces (Wahab et al., 2016)

Active programming is a key characteristic of the Urby building. By organizing multiple activities, the Urby wants to differentiate from other apartment buildings and attract residents. Additionally, the local community is involved in organizing the activities not only creating interaction between residents within the high-rise but also outside the high-rise.

MULTIFUNCTIONAL AND VARIOUS APARTMENTS



High-rises that use this

- Ivry-Sur-Seine
- The Interlace
- The Pinnacle@Duxton
- Linked Hybrid
- Case Study Sustainable Vertical Urbanism
- Urby
- The Stack
- Case Study Cape Town

The third concept is making high-rises multifunctional and create various apartments. These are two separate design features, but they are closely related as to both aim to diversify the residents and visitors to the high-rise. There are three features are related to this design element.

First, making multifunctional high-rises allows visitors to enter the building. These visitors can create spontaneous interactions just as one would have on a regular street. The best example of this is The Stack, where different functional zones are integrated into the building. Important is that the facilities within the high-rise are open to everyone and not for a selected view, as this would decrease the quality of the interactions with visitors (Atkinson & Blandy, 2005; Kirby, 2018).

Additionally, multifunctional usage generates more people inside the high-rise throughout the day. If a high-rise only contains houses most people would leave the building during the day. Multifunctional high-rises, however, create places where people can meet throughout the day (Gehl, 2014).

Second, creating various apartment sizes allows for a mixing of social groups inside the high-rise. This design can lead to more and better quality interactions (Jacobs, 1961; Kirby, 2018). Important for this is that the different apartments are spread out across the whole building. If all the more expensive apartments are located at the top and the cheaper apartments at lower levels, this will still not create interaction between different socio-economic groups. A high-rise that takes this principle into account is the case study in Cape Town.

Third, various high-rises take different apartments a step further. Some buildings detach the layout of the apartments from the structure of the building. Instead of inflexible apartments, this allows the residents to change their apartment. A resident buys a module within the building that can be adjusted to their specific needs. Moreover, the apartment can be changed after completion, allowing it to evolve with the resident. This allows for people to live in the apartment longer, as it can evolve with their changing needs. Additionally, people will feel more attached to their apartment as they influenced its layout. If people feel more attached to their house and live in a high-rise for a longer period, they tend to invest more effort into social interaction with their neighbours (Mann et al, 2014).

CONNECT INDIVIDUAL HIGH-RISES



High-rises that use this

- The Interlace
- The Pinnacle@Duxton
- Elevated Central Walkway
- Linked Hybrid
- Case Study Sustainable Vertical Urbanism

A concept that is mainly used in high-rises in Asian countries is connecting high-rises. In a sole standing high-rise, a resident will enter the building and go to his or her apartment in the most direct way. This same goes when someone exits, a resident will take the shortest route, leaving less time for social interaction. However, if high-rises are connected this creates more ways of walking through a building, creates a larger opportunity for interaction (Jacobs, 1961). Connected high-rises allow residents or visitors to spend more time inside the building. Eventually, connecting high-rises can create vertical urbanism, where the high-rise includes the same infrastructure and facilities as the ground level (Wood, 2014). This would mean that the negative effects of high-rise living on social interaction are diminished, as high-rises are part of the urban fabric.

As mentioned this method is often used in Asian cities where there is a large density of high-rises. Here, the connections between different high-rises are often some kind of public space and facilitate different functions. This creates a real 3D city, giving more street-like qualities and a larger flow of people inside the high-rises. The best example of this is the Central Elevated Walkway in Hong Kong, that creates a truly 3D city. However, the concept can also be applied at a smaller scale. The Pinnacle@Duxton, for example, has two sky bridges that connect 7 towers. The sky bridges have a park-like design and create a flow through the building, allowing residents from the various towers to meet and interact.

CREATE A STREET-LIKE ENVIRONMENT



High-rises that use this

- The Commerzbank Tower
- The Pinnacle@Duxton
- De Citadel
- Family scraper de Maasbode
- Case Study Cape Town

One of the key challenges in high-rise design is that it often lacks the human scale that is present in a low-rise neighbourhood. This lack of human scale makes people feel less safe and results in them not spending much time inside the high-rise, and thus have less interaction (Gehl, 2011). Hence, some high-rises try to bring back the human scale by creating street-like environments inside the high-rise. Additionally, these street-like environments are often more spacious than regular hallways in high-rises. This allows for better quality public spaces that are used more often. The largest issue with this design is that space costs money, as these street-like spaces do not create rent revenue for the owner. Wood (2014) suggests high-rises should be a public-private partnerships. This way public organizations can enforce better living environments that do not focus merely on creating revenue.

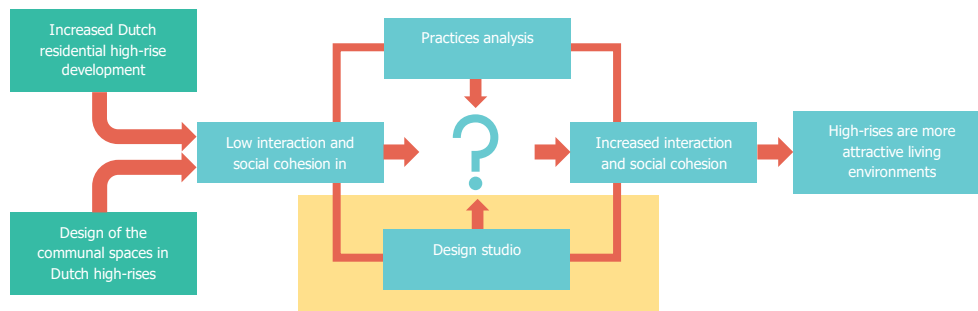
Despite the higher costs, a multitude of high-rises include a more street-like environment. The high-rise Family Scraper De Maasbode even creates real streets that are staged upon each other. The 'streets' have open views on both sides, a brick floor and small trees that align them. Another interesting example is De Citadel which has put a typical suburban neighbourhood including front yards and even a playground.

6. DESIGN STUDIO

The second method used in this research is a design studio. The design studio forms the second part of the secondary research question:

"What key lessons for socially inclusive high-rise design can be derived from international practices and experts, including lessons from low-rise neighbourhoods"

Placing this chapter in the conceptual model, the design studio forms the second separate step in identifying design features that increase social interaction and cohesion. The results of the practices analysis are thus not used as input for the design studio. In this chapter, the results of the design studio will be discussed by sharing the main insights provided by the experts that participated.



The design studio was held at KAW, an architecture and advisory firm. In the design studio, a total of 14 experts participated. The participants have widely varying backgrounds. These backgrounds include; architects, designers, structural engineers, sociologists, planners, geographers and real estate experts. These various backgrounds allow for more quality as each person brings their specific knowledge. One architect was not able to attend the design studio but was interested so an individual conversation was held with him. Although he did not

participate in the design studio he did share valuable insights that are also used in this chapter.

During the design studio, the participants created many useful insights, which they transferred to multiple pieces of paper. However, because these pieces of paper are in Dutch and are not always well readable, their content will be discussed using only a limited number of pictures of the actual sheets of paper, mostly used as an example. In this chapter we will first discuss the results of the individual part, then the collective part and, finally, we will make concluding remarks.

THE FIRST INDIVIDUAL PART

In the individual part, everyone had 5 minutes to come up with six ideas to create socially-oriented high-rises. The participants were discouraged from talking to each other about their ideas and were fully free in how to put down their ideas; write, draw or both. In figure 17 two examples can be seen of how the participants showed their ideas in the assignment. Most of them made a combination of drawings and text. The participants show a wide variety of ideas which are aggregated into six groups:

- Communal spaces
- Apartment orientation
- Use of greenery
- Facilities
- Activities
- Human scale

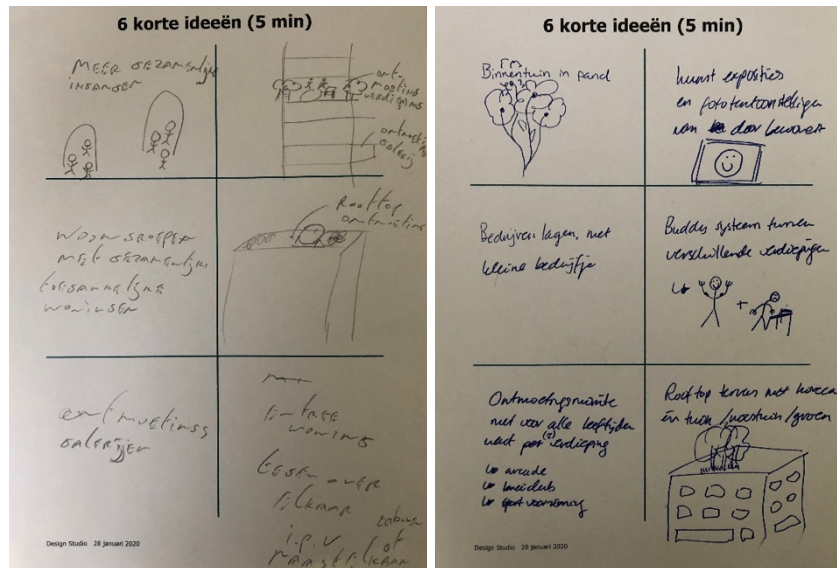


FIGURE 17: EXAMPLES FIRST INDIVIDUAL ASSIGNMENT DESIGN STUDIO

Every participant mentioned something about communal spaces. Their ideas vary from a rooftop garden to co-living environments. Most participants mention there need to be specified rooms for interaction that are scattered across the building. These can be living rooms or activity spaces. Additionally, many participants point to the possibilities of developing spaces on the roof. A roof is a place with attractive qualities, mostly concerning the views. Communal areas on the roof have aesthetic qualities and can pull people towards the top of the building where they can meet and interact. A second idea is to create co-living arrangements in high-rises. A co-living environment can be compared to student housing, where residents share many facilities. Living in a co-living environment requires more interaction between inhabitants. Including co-living areas into a high-rise would create a more social atmosphere that also encourages other residents to interact.

The second feature is about apartment orientation. This relates to how the apartments are situated. In many Dutch flats, the apartments are situated next to each other connected by an outside gallery. However, if the apartments are faced towards each other this could lead to more interaction. This causes you to have more direct neighbours, which makes changes for interaction larger. Additionally, houses should have windows facing the hallway. This is related to Jane Jacobs her 'eyes on the street' principle. More windows make you feel safer and thus cause

you to interact more. In like manner, the windows will cause you to see your neighbours more often, making interaction more likely.

Third, almost all participants agree on the usage of green. Green public spaces are utilized more often than non-green spaces. So, if the building includes more greenery, this will lead to more usage of the spaces inside the building. Usage is an important issue in communal spaces in high-rises, as these spaces only create interaction if they are used. In like manner, greenery on the rooftop could attract more residents to the roof. Additionally, more greenery can reduce the feeling of being in a high-rise and give the space a more neighbourhood-like feel. The participants also pointed out that a key issue with the usage of greenery is maintenance. Greenery requires a lot of maintenance costs. Participants pointed out the possibility for governmental aid, as they also upkeep green areas in neighbourhoods. However, if a government would provide funding, the green spaces inside the high-rise should be publicly accessible.

Fourth, participants pointed out the high-rise should include a mixture of facilities. Besides residential dwellings, different functions should be scattered across the building. Although a multifunctional high-rise does not necessarily lead to more interaction, participants high-lighted the type of facilities. They mainly focussed on facilities with a meeting function, like a café, school or neighbourhood centre. Additionally, one participant talked about a combination with care facilities. He mentioned that there are buildings that are partially used as a care home. The other residents were encouraged to volunteer in the care home, but even if they did not the social interaction was higher as they were more concerned with taking care of each other.

Fifth, to create more social interaction among inhabitants in high-rises, activities should be organized. During these activities those looking for more interaction can participate, leading to a more social atmosphere in the high-rise. An idea that was mentioned multiple times is a vegetable garden. Not only does the maintenance of the garden lead to interaction. Giving away vegetables among residents, or even cooking together, results in even more interaction. Another idea that was mentioned is a buddy system. Chances are big that a high-rise includes residents that are less mobile or can use help with tasks. A buddy system inside the high-rise, for those who want, could be a good way to help people and create more interaction.

The final feature is to create a human scale or street-like feel. Because of their size, high-rises can feel somewhat unhomey. Creating a feeling that you are not in a large flat can help people feel more at home and interact more. This could be achieved by for example giving floors street names, which creates more identity for each floor. Additionally, the hallways in high-rises often include little or no decorations. If residents were allowed to decorate the hallways, just as people decorate their front gardens, or have input in how hallways look, they would feel more at home and be more likely to interact.

THE SECOND INDIVIDUAL PART

In the second individual part, respondents had time to combine or elaborate on ideas and designs they created in the first part. They were given around 5 minutes to create one design or idea (Figure 18). Participants mainly connected different ideas, leaving out the elements they thought less useful and feasible. Hence, the ideas from this second assignment have overlap with the ideas mentioned in the previous section. Nonetheless, this new assignment created more elaborate creative insights that are discussed below.

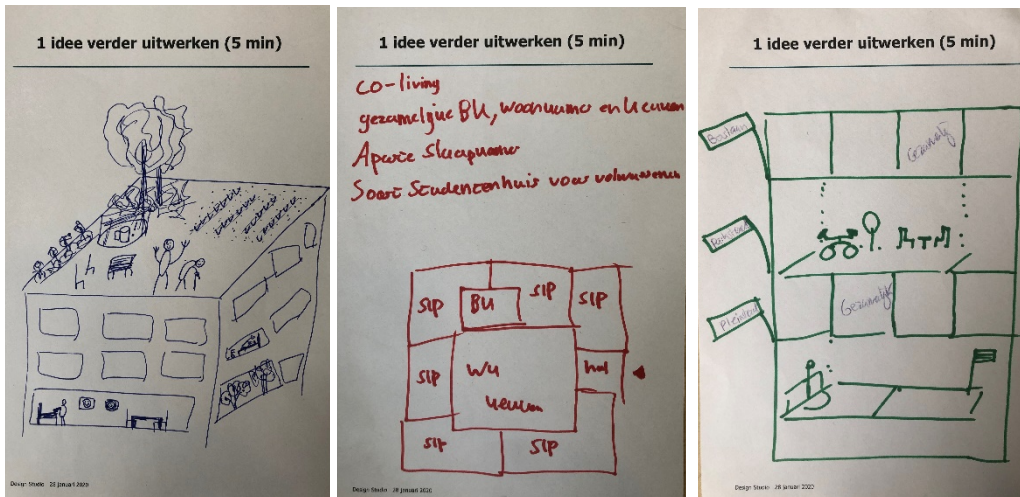


FIGURE 18: EXAMPLES SECOND INDIVIDUAL ASSIGNMENT DESIGN STUDIO

First, all designs give attention to the multifunctional use a high-rise should have. Combining residential, public and commercial functions in a high-rise causes the high-rise to attract visitors. If a high-rise would only contain residences it would be quiet during the day, and a lower amount of people leads to less interaction. Additionally, as mentioned, certain types of facilities can stimulate interaction. A café at the ground or top floor can become a meeting place, where those living in the building and visitors can interact, just as a neighbourhood café can have a cohesive function in the neighbourhood.

The second commonly agreed on design feature is to include multiple common areas. These areas, that for example facilitate a seating area or even a kitchen, can become places where people meet. Opposed to a café, the communal spaces are only for residents and do not require any commercial activity. The biggest issue with these communal areas is usage. Why would a resident utilize this space instead of their own home? The participants took different approaches to solve this issue. Some mentioned small things, for example, table football or other games. This would attract people as one usually does not have them in their home. Besides these smaller interventions, some take it a step further. Multiple participants argue private spaces should be made smaller to ensure people spend more time in the larger communal spaces. One participant talks about creating co-living environments inside high-rises, as discussed in the previous section. The larger communal spaces and smaller private space can lead to more interaction, but not all demographic groups would favour this distribution. As the size of the high-rise stays the same, the prices will as well. So, residents need to be willing to pay the same rent for a smaller apartment, that is compensated by larger communal areas. The question how and if it would be possible to stimulate these kinds of living arrangements was not answered by the participants at this stage of the design studio.

Third, the participants talk about specific design features that should lead to more interaction. They mention the hallways should be made larger and the apartments should have windows facing the hallways or communal areas. This creates a safer feeling and leads to more interaction. Additionally, a participant argues that a resident should be able to walk multiple routes through the building, creating more room for spontaneous interactions. Another participant argues the high-rise should be subdivided into multiple blocks that all have a street-like public space. This would create a feeling of human scale. Finally, a participant mentions it is

important to create diverse apartments on one floor, to ensure greater social mixing.

Finally, there was one participant in particular who talked about the structure of the building. He referred to the ideas of John Habraken, who proposes the separation of "supports" or base buildings from "infills" in residential construction. This separation makes participation in the design of the houses by the inhabitants easier. When inhabitants do not have an influence on the design of the environment they live in, they have less incentive to change or improve their living environment. When structure and infills are separated the residents have an influence on their environment, creating more connection to place. This can result in residents investing more in a place, by partaking in more social behaviour. Additionally, the separation between supports and infills makes it easier to adjust the apartments over time. This allows a resident to live longer in their apartments resulting in them investing more in social relations with their neighbours.

GROUP PART

After the individual part, the participants subdivided into two groups. In the groups, everyone first shared their ideas, after which they worked on combining them into a singular design. Again, there is an overlap between the group and the individual phases, as the former builds upon the latter. To avoid repetition there is a focus on the main conclusion the two groups provide. The insights of both groups are designed below.

The first group takes a rather textual approach and formulates seven principles a socially-oriented high-rise should consider. Accordingly, a high-rise should include:

- Smaller apartments, leaving more room for meeting places that are well maintained.
- A multitude of functions spread across the high-rise (e.g. shops or a cafe).
- Windows facing public areas. Make the apartments face the public spaces, just as in a regular street.
- Different target groups in one high-rise. It is of particular importance to include groups that value community to a greater extent.
- Greenery on the roof and in the public spaces.

- Encourage volunteering among inhabitants. For example, by earning credits for helping elderly neighbours.
- Do not create uniform concrete blocks, but create attractive buildings that provide a sense of belonging to the inhabitants.

Additionally, this group provided a design idea which they called a 'castle'. In this design, four towers are connected by public spaces on different floors. This looks like the designs made in some Asian cities, where individual towers are connected by sky bridges that serve as a kind of public space.

The second group provided other insights into the topic. This group was very much focussed on greenery and communal spaces. In their idea, communal living rooms and kitchens are scattered across the building. These are places where people meet and organize activities together. The participants did recognize that these communal spaces are not preferred by everyone. But they felt that by including demographic groups that value social behaviour, usage of the communal areas could also be stimulated among those who would first value them less. When residents who value the communal spaces less see them actively being used, they might also join. Additionally, greenery on the roof and inside gardens should make attractive places where residents are pulled towards to, instead of only spending time in their own home. Another insight that was of great importance to them is to create a feeling of a neighbourhood. By giving floors street names and making the public space feel like a street more interaction among the residents is encouraged.

CONCLUSIONS

The design studio revealed many valuable insights into the topic. Especially the various backgrounds of the participants led to several multidisciplinary features that are of importance to this topic. In this section we will give an overview of the different features pointed out by the experts and what the goal of the interventions are. This will be done simplistically, via a table, as to goal is to identify the design features, which were already elaborated in the previous section (Table 3). These design features will be used in the next chapter, where the results of the practices analysis and the design studio are combined.

TABLE 3: DESIGN FEATURES DESIGN STUDIO

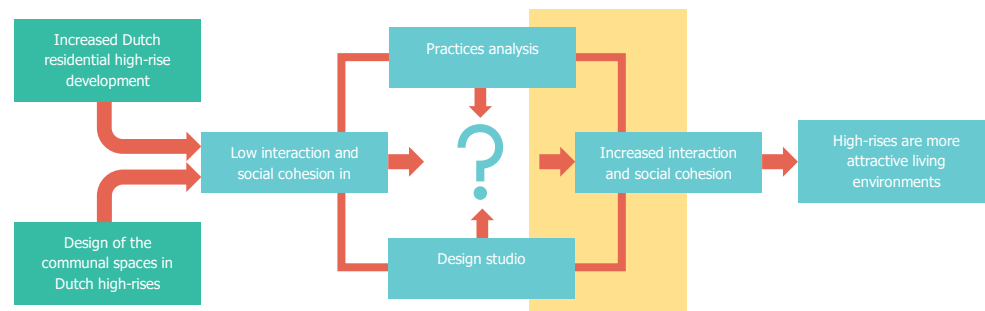
Design feature	Goal
Allow for more personal input in the communal areas	When people have more input in how the building looks they will feel more at home and have more interaction.
Communal areas throughout the building	These communal spaces are places where people can meet and organize activities together. It is important to facilitate this at various places in the high-rise
Diverse apartments	This creates more social mixing, as the high-rise is home to multiple social-economic groups.
Greenery	Green spaces inside the high-rises and at the roof attract people to the communal areas and create a human scale.
Have windows towards the communal areas	Windows allows you to see your neighbours more often and make residents feel safer.
Include co-living environments	Co-living is a living environment in which inhabitants have a lot of social interaction. Including at least a small share of co-living could create a more social atmosphere.
Make dwellings face each-other	When houses face each other, you have more and more connection to your direct neighbours
Multifunctional	Include multiple facilities into the high-rise, with a focus on facilities with a meeting function.
Rooftop development	Rooftops are seen as attractive places. By making them accessible to residents or creating commercial facilities at the rooftop can creating a meeting place where residents (and non-residents) can interact.
Separate supports from infills	This way residents to participate in the design of their house and allows the dwelling to evolve with the needs of the residents
Stimulate activities	Not only can residents meet during these activities, if some residents put effort into social interaction other residents are more likely to follow.
Stimulate volunteering	High-rises include many demographic groups that could help each other out via volunteering.
Street names for different floors	This generates a more neighbourhood like feel and creates a common identity

7. SOCIAL INCLUSIVE HIGH-RISE DESIGN

In the previous chapters, a wide array of design features that create more social interaction were discussed. In this chapter, the results of the practices analysis and design studio are combined. Doing so we answer the final sub question in this research:

"What are design features and ideas that create a more socially inclusive high-rise?"

Looking at the conceptual model, this is the part where the practices analysis and the design studio are combined. Combining the two methods creates an overview of design features that increase social interaction and cohesion.



Combining the two analyses, a wide array of design elements are derived as crucial for socially-oriented high-rise design. Some of these elements are costly to apply and take a lot of effort, while others can be implemented more easily. To create a more meaningful overview, the design elements are aggregated into three high-rise design groups; (i) low effort/costs, (ii) middle effort/costs and (iii) high effort/costs. The subdivision in three different design groups is based on their feasibility. Some design features are costly, resulting in the chances of them being

implemented being low. Nonetheless, these design features possibly have larger effects on social interaction and cohesion, as opposed to the features that take less effort to apply. To ensure each design element is analysed appropriately, the design features are subdivided into three design groups. This does not mean that a high-rise design cannot pick and mix design features from the various design groups.

Each design group, with its corresponding design elements, is examined using a SWOT analysis. In a SWOT analysis, the Strengths, Weaknesses, Opportunities, and Threats of the design features are examined. Doing so, allows for comparisons between the different design options, creating more meaningful input for the conclusions.

A SWOT analysis seeks to address the question of strategy formation from a two-fold perspective: from an external appraisal (of threats and opportunities in an environment) and an internal appraisal (of strengths and weaknesses in an organisation). The two perspectives can be differentiated by the different degrees of control attainable within each. The dynamic and unrestricted nature of the external environment can seriously hamper how a plan will evolve, whilst internal factors are or at least should be, more easily manageable (Karppi et al., 2001). A SWOT analysis is primarily used in issues relating to management. However, it can also be applied to design evaluation (Halla, 2007; Beyhan & Alagoz, 2019).

Karppi et al. (2001) define the elements of the SWOT analysis in the following ways:

- Strength: a resource or capacity the design can use effectively to achieve its objectives
- Weakness: a limitation, fault or defect in the design that will keep it from achieving its objectives
- Opportunity: any favourable situation in the design's environment
- Threat: any unfavourable situation in the design's environment that is potentially damaging to its strategy

7.1 LOW EFFORT/COST DESIGN

From the practices analyses and design studio, a multitude of design features and ideas that can be applied at relatively low cost and effort are identified. As these design features require less effort and costs, they can more easily be realized. However, their effects are most likely also be smaller. The design features that are assigned to this design group are:

1. Give each floor street names
2. Allow for more personal input of the residents in the hallways/communal areas
3. Actively organize activities
4. Stimulate volunteering among residents
5. Have windows face the hallways or communal areas

The first two features aim to create more identity for the residents. A street name is something everyone on the same floor has in common and thus creates a common ground. Additionally, it provides a human scale, instead of living on the 16th floor, a resident can say the name of the street he or she lives in. The second design feature allows for more personal input. Currently, the hallways in Dutch high-rises are often blank spaces, with nothing on the wall, giving it an unhomey feel. Out of fire hazards, residents are often not allowed to put objects in the hallways. However, personal input could also be a picture you hang on your wall or a sign with your name. This would give residents a homely feel and stimulates them to put more effort into social interaction.

The third and fourth design features are about stimulating activities. Organizing activities is not necessarily expensive. Normally, Facebook groups or other communication channels are already active among residents, which can provide a means of communication. A neighbourhood BBQ is a low effort activity that can result in more cohesion, as neighbours get to know each other. The same goes for volunteering. As a high-rise includes many residents chances are someone needs help and someone else is willing to volunteer. The largest issue with this is finding a match. If residents of the high-rise know others volunteer, this can also stimulate more social behaviour among the other residents.

The fifth feature requires a bit more effort and cost. However, when constructing a new high-rise this design element can easily be implemented. Windows facing the hallways or communal areas provide 'eyes on the street' (Jacobs, 1961). This will make people feel safer and thus makes interaction and social behaviour more likely. Additionally, windows allow you to see your neighbours more often and when you see a person more often you will like them more.

Having elaborated on the low effort/cost design features, they can be analysed according to the SWOT model. As mentioned, this allows for better comparability among the design features of the three design groups:

Strengths:

- The design features can easily be implemented, and thus provide good value for money
- They can all be implemented in existing high-rises, although making windows would require more effort

Weaknesses

- As these options do not attract visitors into the high-rise and not more social mixing among residents, the effects on social interaction are minimal
- To organize activities or stimulate volunteering, key players are needed that are willing to put effort into organizing these events. They can also be organized by a third party, but this brings extra costs.

Opportunities

- Just as in the Urby building in Jersey City, activities can be organized by locals, stimulating more interaction with locals and boosting the local economy
- Volunteering leads to more interaction, but first and foremost it also helps those that need it.

Threats:

- The effects of all design features are highly dependent on the willingness of the residents.
 - Residents can easily not attend the activities or not volunteer, demising the effects
 - Residents that want more privacy can put something in front of their window that faces the hallway
 - If residents are allowed to have more personal input in the hallway this can also lead to a mess and a lack of maintenance, negatively influencing social behaviour.

Combining the above, there can be stated that the design features with minimal effort and cost can work, however, they are very dependent on the willingness of the residents. This means the results of the design features are uncertain as the willingness of residents to participate is uncertain.

7.2 MEDIUM EFFORT/COSTS

The second SWOT analysis is completed on the design elements that require medium efforts or costs. These design elements bring extra costs for the developer, but due to their small scale, these costs are minimized. This group includes the features:

1. Create a communal area, for example, a larger lobby
2. Make the hallways larger, combined with the increased personal input of residents
3. Doors opposing each other, combined with windows facing the communal areas or hallways
4. Include more greenery throughout the high-rise
5. Make the high-rise multifunctional on a small scale, for example including a café or a gym.
6. Enforce social mixing by including diverse apartments

The first two features are aimed at creating more places for residents to meet. A communal area is a place where someone can go if he or she wants to interact with his or her neighbours. Additionally, these places can be used to host activities. The largest issue with communal areas is usage. If nobody uses them, their effects will be low and can even be negative if the area deteriorates. To solve this issue the communal area should be made attractive places to stay. This can be achieved by including amenities one does not have in their home. These amenities could be games like a Ping-Pong or a football table or an attractive seating area. This should stimulate residents to use the communal areas instead of their own private spaces. Besides communal spaces, larger hallways create more places for interaction. If a hallway is narrow residents will only use them to commute to their apartment. Larger, and more attractive hallways, could change this. If these spaces are enlarged, residents are likely to spend more time in them. Larger hallways also create fewer problems with fire hazards, meaning residents could, for example, place a bench or a plant in front of their apartment. When they sit on the bench or water plants residents have higher chances of meeting their neighbours, just as in a front lawn in a low-rise neighbourhood.

The third element has is about doors facing each other. This element is already applied in some high-rises, as it is an efficient layout. Nonetheless, this design feature takes it a step further. Doors should be placed towards a small courtyard, meaning people have more neighbours and see them more often. Additionally, this feature should be combined with windows facing the front allows residents to see their neighbours more often.

The fourth design feature is including greenery. During the design studio, the experts emphasized including greenery as it would make places more attractive. Research shows that public spaces with more greenery are used more frequently and have beneficial effects on social behaviour (Pincetl & Gearin, 2005). Including more greenery inside the high-rise can make the communal spaces more attractive, causing them to be used more often. Additionally, of specific importance to high-rises, greenery provides a human scale. When seeing a tree or plants a resident can lose the feeling of being in a large building on the 18th floor.

The fifth design element, multifunctionality, increases social interaction in various ways. First, multifunctional high-rises attract visitors. These visitors can ensure better quality interactions and create more liveliness inside the building. This

liveliness is also more spread out during the day, as people use various facilities at different times. Moreover, facilities like a café or gym can have a meeting function where residents of the high-rise see each other. When you see your neighbours more often, you are more likely to involve in social behaviour with them.

The final design element is social mixing. Including diverse apartment sizes throughout the building leads to a more diverse demographic and socio-economic composition. Not only does this lead to better quality social interactions, but some demographic groups are also more prone to partake in social behaviour. By mixing different socio-economic groups more interaction can be stimulated.

Combing the features above we can identify the following strengths, weaknesses, opportunities, and threads:

Strengths:

- By creating more spaces for interaction in communal areas, hallways and facilities, residents will meet more frequently which potentially leads to more social cohesion
- Making spaces attractive, using greenery, personalize hallways and include facilities one does not have in their home, will increase the usage of the amenities the high-rise offers. More frequent usage leads to more interaction and cohesion

Weaknesses:

- The communal spaces and greenery need to be maintained, this brings additional costs which will indirectly be paid by the residents as their rents or service costs go up
- Whereas commercial facilities inside the high-rise can be used by residents, they will need to pay to use them. This can be a barrier for residents to use the facilities, causing them not to increase social interaction.
- As this design only includes one or two communal areas, to limit the costs, these areas can still be far away for the residents, declining their usage.

Opportunities:

- Including a facility like a café can generate revenue for a developer, as they can rent out space to the café. This way a meeting place for the residents is created, while the developer doesn't lose revenue, so the rents for the residents won't go up
- Locals can also use the facilities in the high-rises, leading to more connection with the urban fabric
- Mixing different socio-economic groups causes the chances for the building to deteriorate to be smaller, especially compared to high-rises that only include residents of a lower socio-economic status

Threats:

- The communal spaces or facilities can also lead to nuisance for the residents. If the café is open until late in the evening residents that live in proximity to it can experience nuisance. The same goes for the communal areas. Youth living in the high-rise can use them as a hangout spot, which is good for their social cohesion, however, it can also cause nuisance and make other residents feel less safe.

Combing the above, the medium effort/costs design elements provide a good basis for making more socially oriented high-rises. Because of their relatively small scale, their feasibility is high and they have sizeable effects. Especially taking the Dutch context into account, with a low number of relatively small high-rises, these design elements can certainly be useful.

7.3 HIGH EFFORTS/COSTS

The third, and final, SWOT analysis takes the design elements that ask for high efforts and costs in consideration. These design elements demand high efforts or are high in cost as they use innovative or extensive methods to enhance social cohesion and interaction. The design features include:

1. Separate infills from the structure, to create more participation in the high-rise design by the inhabitants

2. Connect high-rises by sky bridges
3. Rooftop development
4. Communal space throughout the building, preferably on each floor. To achieve this the private spaces will be decreased in size

The first design feature ensures residents can have more input in the layout of their house. Currently, high-rises contain many homogenous apartments which cannot be altered by the residents, as the structure doesn't allow this.

Nonetheless, every person has different needs, some want a larger living room or only one bedroom. If the structures and infills are separated, residents have more influence on the layout of their apartment. The idea is that if residents put more effort into their own home, they will do the same with their social relations.

Additionally, they will feel more attached to their home, making them more likely to invest in social behaviour. Finally, if structure and infills are separated the apartment can evolve with the changing needs of the residents. This enables residents to live in the houses for a longer time, therefore encouraging people to invest in their neighbourhood as well.

The second design feature uses sky bridges to connect individual high-rises. Doing so, the public space is lifted onto the sky bridges creating multiple ground floors. These sky bridges give residents that live on higher floors more connection to a ground floor like area. These sky bridges are places where people can meet. Additionally, they can host facilities or be (partially) publicly accessible, creating room for spontaneous interactions. Sky bridges also allow residents to take multiple routes through the high-rise. Eventually, sky bridges could even create a 3D vertical city, just as in Hong Kong.

The sky bridges can to some extent be related to the rooftop development, which is in some ways a less extreme form of sky bridges. Rooftop development encourages usage of the space on top of the high-rise, also lifting the public space to a higher level. Just as with the bridges this gives a new ground floor-like area for residents that live high in the building. They are places where residents can interact, but they can also attract visitors if they are publicly accessible. Rooftops of high-rises are usually considered attractive places because of the views they offer. This could attract residents towards the top of the high-rises increasing the usage.

The fourth design feature is creating communal areas throughout the building. This can be combined with making the private spaces smaller, to increase their usage. An extreme variant of this is creating a co-living environment. These are places where residents share certain amenities like a kitchen, enforcing social behaviour. Although creating more communal spaces and reducing private spaces will almost inevitably result in more interaction and social cohesion, residents need to pay the same amount for a smaller apartment. This could scare people from wanting to live in the high-rise.

Combining the features and analysing them according to the SWOT analysis we can state the following:

Strengths:

- Lifting the public space onto sky bridges and rooftops creates multiple areas that serve as a ground floor. Residents living high in the building are more likely to use the sky bridges where they can meet residents that also live close to the sky bridge. Additionally, the scale of sky bridges and rooftops are larger than ordinary communal spaces in high-rises, broadening the activities one can do. For example, the sky bridges in the Pinnacle@Duxton are large enough to host a running track that residents can use.
- Higher-end facilities on sky bridges and rooftops generate a larger flow of visitors throughout the day.

Weaknesses:

- Sky bridges are most suitable in areas with a very high density
- The costs connected to implementing these design features are very high. Inevitably the question arises who will pay for these measures. This can result in only very rich residents being able to live in these high-rises, which is not beneficial for social interaction and cohesion

Opportunities:

- Co-living arrangements are becoming more common in Dutch cities. Various socio-economic groups, but especially singles often cannot find suitable housing and like to share amenities to have closer contact with their neighbours.

Threats:

- When communal spaces are enlarged and apartments made smaller, the prices will stay the same. This can result in people choosing other residences instead of the high-rise, meaning the goal of high-rises, to stop urban sprawl, is not achieved
- If the sky bridges and the rooftops draw in too many visitors the residents may feel out of place. The space will not be theirs anymore, resulting in them not using it.

The design elements belonging to this group are innovative and take a different view on high-rises. Doing so, they create new opportunities and ways we look at high-rises. Nonetheless, the research question of this research is about Dutch high-rises. Taken the scale of Dutch high-rise development into account, these design elements might be too large, or only applicable to exceptionally high-density areas like Rotterdam and The Hague.

7.4 CONCLUSIONS

Having examined all three groups of design features according to the SWOT analysis the following statements can be made. The design features belonging to the medium efforts/costs group are identified as most applicable to the Dutch context. This includes features that fit the small scale of Dutch high-rise development, yet, having a fair impact on social behaviour. The main argument against the design features that require low efforts/costs is that their effects are dependent on the willingness of the residents. This can cause these design features to have limited effects. The main argument against the high efforts/costs is that their scale is too big. These design features are mostly drawn from large

Asian metropolises, which have different urban relations in comparison to Dutch cities. Nonetheless, innovative and ambitious developers and architects can draw from these design features.

8. CONCLUSION AND DISCUSSION

In this final part, all components of this research are combined to answer the research question:

"How can high-rises in the Netherlands be designed in a way that enhances more social interaction and cohesion, compared to current high-rises?"

In the previous chapters; knowledge, practices, ideas, and insights regarding socially-oriented high-rise design are discussed and elaborated. In this concluding chapter, a focus will be on how these design features fit into the Dutch context. Next to this, more generalized statements on socially oriented high-rise design are also provided.

Besides the conclusion, the discussion contains elaboration on the research process, to which extent design can influence behaviour, why a planner's perspective is of importance, what the contribution of this research is to planning practice and which topics are of interest for further research.

8.1 CONCLUSIONS

The main hypothesis of this research is that design can stimulate social interaction and cohesion within Dutch high-rises. This research examines which design features are essential for this, using a research by design (Roggema, 2016). In this section, the conclusions regarding this hypothesis are provided.

The relevance of this research has to do with the growing amount and increased height of residential high-rises in the Netherlands. High-rises are used as a means to supply in the high demand for urban living and stop cities from sprawling. Living in a high-rise should become desirable for all demographic and socio-economic groups in the Netherlands. However, living in high-rises still has a negative stigma and often does not provide suitable living environments that stimulate social

interaction and cohesion. Nevertheless, social interaction and cohesion are of importance, especially as loneliness in the Netherlands is rising.

In chapter 7, the design features derived from the practice and the design studio are aggregated and analysed using multiple SWOT analyses. From these analyses, it has become clear that, especially in the Dutch context, design elements belonging to the group that take medium efforts and cost are most suitable. Dutch high-rises are most often developed in small clusters or independently. This causes more extreme measures, like sky bridges to be less applicable. Instead, moderate measures are more applicable. The design elements that belong to the medium group are overall more effective than those belonging to the low efforts/cost groups, as these are very dependent on the willingness and participation of the residents.

From the findings of this research, it becomes clear that all design elements that enhance social interaction and cohesion aim to create the following: (i) increase usage of communal spaces and (ii) make people feel safe. Two concepts that can clearly be linked to the two most guiding researches of this research by Gehl and Jacobs.

When more people use communal spaces, the residents will have more interaction. As Gehl (2011) mentions people attract people. If the communal spaces are utilized more often this will lead to more interaction and cohesion. As can be derived from the previous chapters. usage of communal spaces can be increased in a multitude of ways. In chapter 7, the following design elements that increase the usage of the communal areas are identified as most meaningful for the Dutch context:

- Create larger and more communal spaces where people can interact
- Makes communal spaces more attractive, by for example incorporating greenery or activities
- Increase personal input of residents to make the high-rise feel homely and increase the effort residents put into their living environment

The second key goal of the design features is to make people feel safe. This corresponds largely to the literature of Jacobs (1961). According to her, our cities are full of strangers and it is key for people to feel safe. In a safe city, or in this case a high-rise, people will have more contact which leads to greater cohesion.

Safe environments are created by; (i) a clear demarcation of public and private space, (ii) eyes on the street and (iii) continuous usage. Additionally, Jacobs emphasizes on diversity. As one can observe, the concept of safety overlaps with the increased usage of communal spaces. From the analysis in chapter 7, the following design features are meaningful to the Dutch context:

- Multifunctional high-rises, to ensure continuous usage and diversity while keeping a clear public-private demarcation
- Diverse apartments creating diversity in residents. Additionally, diversity of residents can result in more continuous usage of the communal areas as various groups have different daily rhythms
- Create eyes on the street, by making windows face the communal spaces
- Organize activities for residents, where they can meet and generate usage of the communal areas

Other design elements will also have a positive influence on social cohesion and interaction. These design elements can be found in chapter 7 and are not elaborated here, as they are less applicable to the Dutch context. Overall, we can state that design can greatly influence people's social behaviour in high-rises (Brown & Mairer, 2015). Making them more suitable living environments for diverse demographic and socio-economic group.

Moving away from the Dutch context and making more general statements on high-rise development across the world. High-rises are often seen as status objects that create symbols for cities. This can contribute significantly to the identity of a city, think of the Empire State Building and the Petronas Towers. Nonetheless, attention needs to be given to the residents. Design elements that increase social interaction and cohesion cost money, which private parties are often not willing to pay for. Wood (2014) mentions this asks for a complete reconceptualization of how we build a vertical city. He argues public-private partnerships can enhance the attention given to creating attractive living environments in high-rises, as public organizations are more concerned with the wellbeing of residents. Public-private partnerships also create opportunities for people with a lower socio-economic status to live in good quality high-rises, something which is without this partnership too expensive. A city that can be seen as an example in these public-private partnerships is Hong Kong. As has been discussed, Hong Kong has an elaborate network of pedestrian zones inside and

connecting high-rises. These zones are enforced by the government and create a vertical city. Within these vertical city there is more room for spontaneous interaction, just as on the street-level.

8.2 DISCUSSION

In this research, the assumption that design can stimulate social behaviour is leading. Although this is indeed the case, as can be derived from the literature (Brown & Maier, 2015), design is not the only factor at play. From a more holistic perspective, many other factors influence the social behaviour of people. It is meaningful to consider resident composition, economic trends, location and a multitude of other factors that potentially influence the social behaviour of high-rise residents. This does not mean examining the influence of design is not meaningful, as it is a key factor, but the design is not the sole determinant. Because of the scope of this research and the background of the writer, solely the design of the high-rise is examined with a focus on the communal areas. Further research could focus on other factors, to broaden the perspective on socially-oriented high-rises, increasing the quality and quantity of the small volume of literature on this topic.

Another key component of this research to consider is that it is written from the perspective of a social planner. Planning studies the effect of the distribution of people and activities in spaces of various scales. They often take a holistic approach drawing from numerous academic fields. Usually, research regarding high-rises are made by architects, providing only their perspective. The architectural view is of importance and thus included in this research, by participating in the design studio, however, the focus of this research is on a broader context. As this research is written from the perspective of a social planner the issue is viewed from another, less structural, perspective. This broader view is, in my opinion, important to consider, as socially-oriented high-rise design exceeds the field of architecture. As high-rises are basically small neighbourhoods it is of interest to examine how people behave within the built environment of a high-rise. Therefore, it is meaningful to incorporate diverse fields of research into the planning of high-rises, including social planners. The more holistic view on the influence of design is enlarged by not only including the perspective of planners

and architects in the design studio, but also that of sociologists, real estate experts and geographers.

Not only is the planners perspective a meaningful addition to this topic. This research also has a contribution to planning practice. Planners are specialists in designing low-rise neighbourhoods and look how the design influences behaviour. Additionally, social planners take consideration of justice theories, looking if how we plan our environment is just. This is, until now, almost always done outside the level of the building, however, this research shows that planning can contribute to the discussion on how to design the inside of the building. An increasing amount of buildings includes some kind of public or communal space. These are, just as streets, places where people undertake activities, and thus of importance to planning. Additionally, planners are experts in stakeholder management. This has become of particular importance in today's participation society. When a high-rise includes the design features this research identifies, stakeholder management would gain importance, as the design features often demand tasks from multiple stakeholders. In like manner, the public-private partnerships Wood (2014) talks about also require more intensive stakeholder management. The main contribution of this research to planning is that it indicates that planners can also be of importance inside building instead of solely outside the building.

For further research, it is meaningful to incorporate the opinions and insights of end-users and stakeholders. These are two key groups in high-rise development that have not been considered within the scope of this research. The end-users are the people living in high-rise buildings. Examining which design elements they favour and how they think social cohesion and interaction can be improved is certainly a meaningful contribution, as they have first-hand experience with high-rise living. Stakeholders are another key group. This mainly includes developers and governments. The developers are the party that invest in the high-rise and thus ultimately decide on the design. Taking their views into account allows for a better financial image of the topic. In addition, it is meaningful to combine the views of the developers with that of governmental organizations. Governments make the laws to which high-rises need to conform and are concerned with creating good living environments for the residents. As mentioned in the literature, public-private partnerships can create a novel view on how we perceive high-rises, further research could examine these partnerships to a greater extent.

This research's main methods are practice analysis and design studio. By including multiple sources for the identification of the design elements the quality is improved. Additionally, the SWOT analyses in chapter 7 are included to provide a more qualitative analysis of the design elements. Nonetheless, this research is not an exact study, meaning, the writer in some way influenced the results of research. As the results are not quantifiable and are all interpreted by the writer. This is often the case in social studies, but it is important to consider. This effect is reduced by including the insights of experts during the design studio. The design studio was structured in a way that it would not push the participants towards certain ideas. Nonetheless, most participants of the design studio were colleagues to whom I had already talked about my research previous to the design studio. This means they are to some extent influenced in their design ideas to what I explained about my research. This is hard to overcome and the effects are minimal as they are experts and most likely already had some knowledge on the topic and could evaluate what I previously told them about my research, meaning they did not copy me word to word.

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